EPA/ROD/R07-04/657
2004

EPA Superfund
Record of Decision:

RICHARDS GEBAUR AIR FORCE BASE
EPA ID: MO9571824292
OU 01
BELTON, MO
09/23/2004

AIR FORCE REAL PROPERTY AGENCY

Final
Record of Decision
(Operable Units 1 and 2)

Former Richards-Gebaur Air Force Base, Missouri

June 2004

Record of Decision
(Operable Units 1 and 2)

Final

Former Richards-Gebaur Air Force Base, Missouri

Prepared by

Air Force Real Property Agency
Arlington, VA

June 2004

Final Record of Decision
(Operable Units 1 and 2)

Former Richards-Gebaur Air Force Base,
Kansas City, Missouri

Prepared by

Air Force Real Property Agency (AFRPA)
Arlington, VA

June 2004

Contents

Figures

Tables

Appendices

Acronyms

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AFRPA	Air Force Real Property Agency
ARARs	Applicable or Relevant and Appropriate Requirements
ASL	Any-use Soil Level
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
BCT	BRAC Cleanup Team
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, and xylenes
CALM	Cleanup Action Levels for Missouri
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1 ,2-dichloroethene
COC	Chemicals of Concern
COPC	Chemicals of Potential Concern
1,1-DCE	1,1-dichloroethene
DoD	Department of Defense
DRO	diesel range organic
EBS	Environmental Baseline Survey
ECS	Evaluation and Consolidation Study
EE/CA	Engineering Evaluation/Cost Analysis
FFS	Focused Feasibility Study
FS	Feasibility Study
gpm	gallons per minute
GRO	gasoline range organic
HHRA	Human Health Risk Assessment
HRC	hydrogen releasing compound
IC	Institutional Control
IRA	Interim Removal Action
IRP	Installation Restoration Program
KCPDD	Kansas City Planning and Development Department
LTM	long-term monitoring
LUC	Land Use Control
MCL	Maximum Contaminant Level
MDNR	Missouri Department of Natural Resources
MDOH	Missouri Department of Health
MOA	Memorandum of Agreement
NCP	National Contingency Plan
NFRAP	No Further Response Action Planned
O&M	operation and maintenance
OU	Operable Unit
OWS	oil/water separator
PAH	polyaromatic hydrocarbon
PA	Preliminary Assessment

PA/SI	Preliminary Assessment/Site Inspection
PCB	polychlorinated biphenyls-
PCE	tetrachioroethene
POL	petroleum, oil, and lubricant
ppb	parts per billion
ppm	parts per million
QGM	quarterly groundwater monitoring
RAB	Restoration Advisory Board
RACG	remedial action cleanup goal
RAGS	Risk Assessment Guidance for Superfund
RAO	Remedial Action Objective
RBCA	Risk-Based Corrective Action
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
STARC	Soil Target Concentration
SVOC	semivolatile organic compound
TCE	trichloroethene
TDS	total dissolved solid
TPH	total petroleum hydrocarbon
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
USMC	United States Marine Corps
UST	underground storage tank
VOC	volatile organic compound
VSI	Visual Site Inspection

1. Declaration Summary

1.1 Site Name and Location

The Former Richards-Gebaur Air Force Base (AFB), Kansas City, Missouri.

- Operable Unit 1 (OU-1) is designated for soils.
- Operable Unit 2 (OU-2) is designated for groundwater.

1.2 Statement of Basis and Purpose

This Record of Decision (ROD) presents the selected remedies for two (2) sites with contaminated soils (OU-1) and six (6) sites with contaminated groundwater (OU-2) at the former Richards-Gebaur AFB, Kansas City, Missouri.

The selected remedies were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record files for the sites in question and complies with 40 Code of Federal Regulations (CFR), Part 300.

The purpose of this ROD is to set forth the selected actions to remediate or mitigate the potential risks to human health and the environment posed by residually contaminated soil and groundwater that has been adversely affected by past operations at the former Richards-Gebaur AFB. The United States Air Force (USAF) has selected the remedies, in concurrence with the Missouri Department of Natural Resources (MDNR) and the United States Environmental Protection Agency (USEPA) Region VII. Together, the three (3) entities make up the Base Realignment and Closure (BRAC) Cleanup Team or BCT.

1.3 Assessment of the Site

1.3.1 Background

This ROD specifically addresses two (2) sites remaining with residual soil contamination and six (6) sites with residual groundwater contamination. However, during the 2000/2001 Remedial Investigation (RI), twelve (12) individual sites with soil contamination were assigned to OU-1 and six (6) individual sites with groundwater contamination were designated OU-2 (CH2M HILL, 2001 a).

The results of the RI determined which OU-1 and OU-2 sites were contaminated and required further action; and which sites were uncontaminated and therefore could be closed- out and assigned No Further Response Action Planned (NFRAP) status. Accordingly, six (6) OU-1 sites were issued NFRAP decision documents by the BCT, and six (6) OU-1 sites and six (6) OU-2 sites required further action.

Four (4) of the six (6) remaining OU-1 sites were subsequently addressed via Interim Removal Actions (IRA) and were issued NFRAP decision documents that were signed by the BCT. The two (2) remaining OU-1 sites (FT002 and STOO5) and the six (6) OU-2 sites is the subject of this ROD.

Table 1 presents a complete list of the OU-1 and OU-2 sites originally examined during the Basewide RI together with their CERCLA process mechanisms and the form of the final site closure decision document (i.e., NFRAP or ROD). Please note that all NFRAP decision documents listed in Table 1 were signed by the BCT (i.e., USAF, MDNR, and USEPA) and are available to the public as part of the Administrative Record for the former Richards- Gebaur AFB. The NFRAP decision documents are also available in the Information Repository maintained at the Grandview Mid-Continent Public Library in Grandview, Missouri.

TABLE 1—SUMMARY OF CERCLA ACTIONS AT OU-1 AND OU-2

OU	RI	FS	EE/CA	FFS	Closure
OU-1 (Soli) Sites					
AO0001—Central Drainage Area	X		X		NFRAP
AOCO02—North Drainage Pond	X		X		NFRAP
AO0010—Building 918 Parking Lot	X				NFRAP
CS001—Fuel Line 942 Section	X				NFRAP
CS002—Oil/Water Separator (OWS) at Building 704	X				NFRAP
FT002—North Burn Pit	X		X	X	ROD
OT010—Small Arms Firing Range	X		X		NFRAP
SS004—Hazardous Waste Drum Storage Area	X				NFRAP
SS008—Test Cell Area	X				NFRAP
ST005—Petroleum, Oil and Lubricant (POL) Storage Yard	X		X	X	ROD
ST007—Former Underground Storage Tank (UST) Area	X		X		NFRAP
XO001—Belton Training Complex	X				NFRAP
OU-2 (Groundwater) Sites					
SS003—Oil Saturated Area	X	X			ROD
SS006—Hazardous Material Drum Storage Area	X	X			ROD
SS009—Fire Valve Area	X	X			ROD
SS012—Communications Facility at Building 105	X	X			ROD
ST005—POL Storage Yard	X	X			ROD
ST011—UST-620A (formerly CS004)	X	X			ROD

The response actions selected in this ROD for OU-1 (two sites) and OU-2 (six sites) are necessary to protect the public health or welfare or the environment from actual or

threatened releases of contaminants from these sites that may present an imminent and substantial endangerment to public health, welfare, or the environment.

The anticipated reuse at the former Richards-Gebaur AFB is commercial- and light industrial. The primary purpose of the remedial action is to prevent direct human contact with remaining residual hydrocarbon concentrations in soils or with contaminated groundwater until these media have respectively achieved levels deemed protective of human health and the environment for unrestricted use ("Remedial Action Cleanup Goals" or "RACGs"). Residential reuse is not currently planned or anticipated; however, because the Air Force did not undertake a site-specific risk assessment for remaining Total Petroleum Hydrocarbons (TPH) after completion of excavation work at these sites, and because there remains some hydrocarbon contamination above state unrestricted use levels, this ROD further prohibits residential land use of these sites.

1.3.2 OU-1 (Soils)

This ROD addresses two (2) OU-1 sites: the North Burn Pit (FT002) and the POL Storage Yard (ST005). The two (2) OU-1 sites, following completion of IRAs, still contained isolated pockets of soil contaminated with residual petroleum hydrocarbons (TPH). The contamination is considered a result of historical spills and leaks that occurred during the routine storage and handling of petroleum products at the Base during the past operation of the North Burn Pit and the POL Storage Yard. Both facilities have been decommissioned and are no longer present.

Because TPH values represent a group of compounds that were not individually assessed for risk, the BCT agreed to evaluate TPH concentrations in comparison to applicable MDNR Cleanup Action Levels for Missouri (CALM) soil target concentrations for TPH (which are 200 parts per million (ppm) for unrestricted use and 500 ppm for commercial-light industrial use). Although the CALM criteria for TPH were not quantitatively derived, this ROD assumes that the CALM Scenario A unrestricted use criterion for TPH (200 ppm) is protective of human health and the environment; this number is also assumed as the RACGs for soils.

Following completion of the IRAs, three (3) sample locations remain at FT002 where residual hydrocarbon concentrations exceed the RACG for TPH of 200 ppm and one (1) sample location remains where the residual TPH concentration also exceeds the commercial-light industrial RACG of 500 ppm. Similarly, at ST005, 26 sample locations remained where residual hydrocarbon concentrations exceeded the unrestricted RACG for TPH of 200 ppm.

Detailed descriptions of the nature and extent of soil contamination at the two (2) sites are provided below in Section 2.5.6.

1.3.3 OU-2 (Groundwater)

There are six (6) OU-2 sites that are part of this ROD: SS003, SS006, SS009, SS012, ST005, and ST011 (see Table 1 above). Groundwater beneath the six (6) OU-2 sites is contaminated with volatile organic compounds (VOC), including trichloroethene (TCE), cis-1,2-dichloroethene (DCE), and vinyl chloride. It is likely that groundwater contamination originates from the past storage or handling of solvents that were routinely used to clean oily machine parts when the Base was operational. To help monitor the contamination, a Quarterly Groundwater Monitoring (QGM) program was established for the six (6) sites in question.

The results of the October 2003 QGM show that TCE is present at all six (6) sites with maximum concentrations ranging from 13 parts per billion (ppb) at ST011 to 2,950 ppb at SS006. The RACG for TCE is 5 ppb (based on the federal Maximum Contaminant Level (MCL) under the Clean Water Act). Cis-1,2-DCE occurs, at two (2) sites-with maximum concentrations ranging from 149 ppb at SS009 to 250 ppb at SS006. The RACG for cis-1,2- DCE is 70 ppb (based on MCLs). Vinyl chloride is found at five (5) sites (it is not found at SS003) with maximum concentrations ranging from 4.7 ppb at ST011 to 23.6 ppb at SS006. The RACG for vinyl chloride is 2 ppb (based on MCLs). Please refer to Table 2 in Section 2.10 for a complete list of groundwater RACGs. In addition, detailed descriptions of the nature and extent of groundwater contamination at OU-2 sites is provided below in Section 2.5.7, which also includes figures depicting the areas of groundwater contamination.

A risk assessment was conducted for each OU-2 site to evaluate the potential current and future effects of VOCs in groundwater on human health and the environment. Although the expected reuse of the property is commercial or light industrial, risks to both residents and workers were estimated, which support the determination here to restrict the extraction or use of contaminated groundwater until RACGs are achieved.

For OU-2 sites, risk assessment results indicated that an excess lifetime cancer risk of between 3×10^{-3} and 4×10^{-5} was associated with potential residential consumption of contaminated groundwater. However, residential use of groundwater as a domestic water supply is highly unlikely given the poor quality and low yield of groundwater in the area of the former Richards-Gebaur AFB, and the fact that local residents are already supplied with domestic water by the city of Kansas City. Nevertheless, this ROD proposes prohibiting groundwater extraction or use so as to cut off this potential exposure pathway.

1.4 Description of Selected Remedy

Remedial alternatives for the two (2) OU-1 sites were initially evaluated using an Engineering Evaluation/Cost Analysis (EE/CA) (CH2M HILL, 2001 b); following the IRAs, residual risks were further evaluated through a Focused Feasibility Study (FFS) (CH2M HILL, 2002a). Remedial options for OU-2 were evaluated separately in a Feasibility Study (FS).

1.4.1 OU-1 (Soils)

The initial remedial action component for FT002 and ST005, based upon the results of the EE/CA, was excavation and offsite landfill disposal of the contaminated soils. The IRA was a significant aspect of the overall remedy for the two (2) sites and resulted in the removal and disposal of the majority of contaminated soil present. However, after the IRA was completed, FT002 and ST005 still contained isolated areas of subsurface soil where residual concentrations of petroleum hydrocarbons remained above MDNR's unrestricted land use criterion for TPH of 200 ppm. Consequently, the two (2) sites were further examined in the FFS to evaluate the relative advantages of further soil excavation to achieve unrestricted use levels versus applying Land Use Controls (LUC) to prevent direct exposure to residual petroleum hydrocarbons in soil.

Based on the alternatives evaluation conducted in the FFS, the Air Force, with concurrence from MDNR and USEPA, selected LUCs as the final remedy for those areas of the two (2) OU-1 sites where concentrations of residual petroleum hydrocarbons in soils exceed MDNR's unrestricted land use criterion of 200 ppm. LUCs are legal, administrative, or physical constraints that restrict or control access to property. They include institutional controls and site controls. Institutional controls are non-engineering, non-technical

mechanisms used to prevent or control exposure to contaminants and commonly are applied to property titles. Site controls are physical means to control site access, such as fences, warning signs, and other security features. Site controls are not proposed in this ROD for OU-1.

LUCs will be used to minimize the potential risk of direct exposure to contaminated subsurface soil above the CALM-based RACG for unrestricted land use of 200 ppm TPH at the former Richards-Gebaur AFB by prohibiting excavation of such soils and limiting property use to commercial or light industrial (see Figures 2-4 and 2-5 below). The primary LUC mechanism will be restrictive covenants placed in the property Deed. The Deed will grant right-of-access to the Air Force, MDNR, and USEPA and will include provisions for the release of the restrictive covenants. The LUCs will remain in place until the RACG of 200 ppm for TPH is achieved.

In addition, the Deed will include a CERCLA 120(h)(3) covenant warranting that all remedial action necessary to protect human health and the environment with respect to hazardous substances remaining on the property has been taken before the date of the Deed; and that any additional remedial action necessary after the date of the Deed for contamination on the property existing prior to the date of the Deed will be conducted by the USAF.

A metes and bounds survey description of the LUC boundaries will be completed by the Air Force and provided to MDNR and USEPA. For OU-1 sites, the LUC boundaries will encompass the known locations of residual TPH contamination where TPH concentrations are above the CALM-based RACG for unrestricted land use of 200 ppm.

The LUC mechanisms will be regularly monitored by the Air Force and appropriate regulatory agencies to ensure satisfactory compliance and continued protection of human health and the environment. See Section 2.14.3 paragraph (1).

In addition to monitoring, Five-Year Reviews of each site will be conducted in accordance with Section 121c of CERCLA. The LUCs will be removed when soil-sampling results indicate that concentrations of petroleum hydrocarbons are at or below the CALM-based RACG for unrestricted land use of 200 ppm.

The LUC remedy is considered reasonable and feasible because no ongoing releases of hazardous substances exist at the OU-1 sites and because the remaining contamination is associated with known isolated soil sample locations. The remedy protects human health and the environment by preventing direct access to areas of contaminated soil with TPH concentrations above the CALM-based RACG for unrestricted land use of 200 ppm.

1.4.2 OU-2 (Groundwater)

Based on alternatives evaluated in the OU-2 FS (CH2M HILL, 2002b), the Air Force, with concurrence from MDNR and USEPA, selected LUCs (supported by LTM) as the final remedy for contaminated groundwater at the former Richards-Gebaur AFB.

LUCs will be imposed to preclude extraction and any use of the contaminated groundwater at each of the six (6) OU-2 sites. The LUCs will be identified in a restrictive covenant placed within the property Deed for SS006, SS012, ST005 and ST011; equivalent use restrictions will apply to property being transferred to the United States Navy for SS003 and SS009. The Deed will also grant rights of access to the USAF, MDNR, and USEPA and will include provisions for release of the restrictive covenants.

In addition, the Deed will include a CERCLA 120(h)(3) covenant that will warrant that all remedial action necessary to protect human health and the environment with respect to

hazardous substances remaining on the property has been taken before the date of the Deed; and that any additional remedial action found to be necessary after the date of the Deed for contamination on the property existing prior to the date of the Deed will be conducted- by the USAF.

A long term monitoring (LTM) program for ground water will support the LUCs and allow systematic, periodic evaluation of site groundwater quality to help ensure that the established LUC boundaries fully encompass the contaminant plumes and remain protective of human health and the environment. The Air Force will consult with MDNR and USEPA regarding basic features of the LTM program prior to its implementation at the former Richards-Gebaur AFB. Such features include identifying the monitoring wells that constitute the LTM network, and establishing the necessary analytical methods and frequency of monitoring based on assessed risk and the remedial action objectives identified in the ROD. LTM is designed to confirm that contaminant plumes remain contained within the LUC boundaries or provide a basis for determining additional actions should consecutive LTM results indicate that contaminant migration is occurring.

A metes and bounds survey description of the LUC boundaries for each site will be completed by the Air Force and provided to MDNR and USEPA. For OU-2 sites, the LUC boundaries will be conservatively located a minimum of 100 feet down gradient of the LTM network. This distance is based upon average estimated groundwater flow rates of between one (1) foot per year and 10 feet per year, as presented in Section 8 of the RI Report. In other words, the down-gradient LUC boundary position would provide a physical buffer representing a time range of between 10 years and 100 years before contaminated groundwater could reach the LUC boundary. The Air Force, consulting with MDNR and USEPA, also took into account existing property boundaries when establishing feasible LUC boundaries for restricting groundwater extraction and use.

The LUC mechanisms will be monitored regularly by the United States and appropriate regulatory agencies to ensure necessary compliance and continued protection of human health and the environment. See Section 2.14.3 paragraph (1).

In addition to monitoring, Five-Year Reviews of each site will be conducted in accordance with Section 121c of CERCLA. The LUCs will be removed when the concentrations of contaminants in groundwater are below the RACGs listed in Table 2 for two (2) consecutive sampling events occurring at least three (3) months apart but no longer than one (1) year apart.

The LUC remedy is considered reasonable and feasible because no ongoing sources or releases of hazardous substances exist at the OU-2 sites. The remedy protects human health and the environment by preventing access to contaminated groundwater.

1.5 Statutory Determinations

The selected remedies are protective of human health and the environment, comply with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, are cost-effective, and use permanent solutions and alternative treatment technologies to the maximum extent practical. The selected remedies do not satisfy the statutory preference for treatment as a principal element of the remedies.

It is important to recognize that the majority of the petroleum contamination in soil was removed through IRAs that took place at OU-1 sites between 2001 and 2002. Furthermore,

the residual petroleum concentrations in soils will naturally decrease with time because of biodegradation and other attenuation processes. With regard to OU-2 sites, groundwater wells at the installation exhibit low production rates that would make active remediation very difficult and costly; furthermore, local groundwater is not used for domestic purposes because of ubiquitous poor yields and poor quality, and the communities surrounding the former Richards-Gebaur AFB receive municipal water supplies from the city of Kansas City. As a key control, the restrictive covenants that are part of the OU-2 remedy will prohibit extraction of groundwater at the OU-2 sites for any use.

Because these remedies will result in contaminants remaining on-site above levels that will allow for unlimited use and unrestricted exposures, a statutory review will be conducted within five (5) years after initiation of remedial action, and at a minimum frequency of once every five (5) years thereafter to ensure that the LUCs (and the land use assumptions that the LUCs are based on) are, and will remain, protective of human health and the environment until RACGs for soil and groundwater are achieved.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record for the former Richards- Gebaur AFB.

- Chemicals of concern (COC) and their respective concentrations (Section 2.5)
- Baseline risk represented by the chemicals of concern (Section 2.7 and Section 2.8)
- Cleanup levels for chemicals of concern and the basis for these levels (Section 2.10)
- How source materials constituting principal threats are addressed (Section 2.13)
- Current and reasonably anticipated future land use assumptions, and current and potential future beneficial uses of groundwater, used in the baseline risk assessment and ROD (Section 2.6)
- Potential land and groundwater uses resulting from the selected remedy (Section 2.6)
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.12)
- Key factors that led to remedy selection (Section 2.12)

1.7 Authorizing Signatures

Ms. Cecilia Tapia
Director of Superfund Division,
U.S. Environmental Protection Agency,
Region VII

9/23/04
Date

Mr. Steve Mahfood
Director, Missouri Department of Natural Resources

9/10/04
Date

Mr. Albert F. Lowas, JR.
Director, Air Force Real Property Agency

July 23, 2004
Date

2. Decision Summary

This decision summary provides a description of the two (2) remaining OU-1 sites and six (6) OU-2 sites at the former Richards-Gebaur AFB and summarizes legal and public involvement issues, site risks, remedial alternatives, the rationale for remedy selection, and how the selected remedy satisfies statutory and regulatory requirements. Details of the OU -1 and OU-2 site investigations and risk assessment are presented in the Basewide RI Report (CH2M HILL, 2001 a), and Basewide RI Report Addendum (CH2M HILL, 2002c).

The contaminated OU-1 sites were further examined in an EE/CA to help identify the most effective method of site restoration (CH2M HILL, 2001 b). The outcome of the EE/CA was a recommendation to excavate contaminated soil and dispose of it at an appropriately permitted landfill. The resulting IRAs at the six (6) OU-1 sites are documented in the 2003 Interim Action Report (CH2M HILL, 2003b).

The IRAs successfully remediated four (4) of the six (6) OU-1 sites to unrestricted land use cleanup goals (A00001, A00002, OT010, and ST007). Accordingly, the four (4) sites were assigned NFRAP decision status by the BCT. Please refer to the pertinent NFRAP decision documents for details regarding the completed OU-1 site closures (CH2M HILL, 2003c; 2003d; 2003e; 2003f). The NFRAP documents are part of the Administrative Record for the former Richards-Gebaur AFB and are available in the Information Repository maintained at the Grandview Mid-Continent Public Library in Grandview, Missouri. The NFRAP sites will not be discussed further in the ROD.

Although largely successful, the IRAs left isolated pockets of residual petroleum hydrocarbon contamination at two (2) OU-1 sites, FT002 and ST005. Evaluation of additional remedial action at these sites was undertaken and presented in a FFS (CH2M HILL, 2002a). The outcome of the FFS provides the basis for the final remedial action for the two (2) OU-1 sites that is documented in this ROD.

Remedial options for the OU-2 sites were evaluated and presented in detail in the FS report for OU-2 (CH2M HILL, 2002b). Additional water quality data from the ongoing QGM program at OU-2 sites (CH2M HILL, 2001-2003) were also used in preparation of the FS Report. The final remedial action for the six (6) OU-2 sites is documented in this ROD.

2.1 Site Name, Location, and Brief Description

The former Richards-Gebaur AFB is located in west-central Missouri, 18 miles south of downtown Kansas City and three (3) miles east of the Kansas-Missouri State line (Figure 2- 1). The north part of the Base is in Jackson County, the south part in Cass County. The Base is bordered by the City of Belton on the east and south, and by Kansas City to the north and west.

Environmental restoration has been conducted in accordance with CERCLA under the Air Force Environmental Restoration Program using BRAC funding. MDNR provides primary oversight of environmental restoration actions, supported by USEPA. MDNR, together with the Air Force and USEPA, comprise the BCT.

Currently the Air Force owns approximately 233 acres of the former installation. The property includes former aircraft hangars, equipment and grounds maintenance shops, materials storage facilities, communication facilities, and administrative support buildings. The Air Force also retains ownership of five (5) areas that are not contiguous with the main installation. These are the fire training area, the air traffic transceiver facility, the small arms firing range, the survival equipment shop, and the non-destructive inspection laboratory.

Brief descriptions of the remaining two (2) OU-1 sites and six (6) OU-2 sites are provided below. Please refer forward to Section 2.5 for a detailed description of the sites, including the location, nature, and extent of contamination at each of the sites addressed in this ROD.

2.1.1 OU-1 (Soils)

The remaining two (2) OU-1 sites, FT002 and ST005, are briefly described below. The locations of both sites are shown in Figure 2-2. Figures 2-4 and 2-5 illustrate the residual contamination remaining at the sites.

2.1.1.1 FT002—Fire Training Area

Site FT002, the former Fire Training Area, is located in the northern part of the former Richards-Gebaur AFB, north of the former airfield, several hundred feet inside the north boundary of the Base. The site was constructed in 1965 for fire department training and the - storage of combustible materials. The site occupies approximately 100,000 square feet and is situated on a topographic high at the Base. No surface water bodies or sediments exist onsite. The remaining volume of contaminated soil is estimated to be 170 cubic yards.

2.1.1.2 ST005—POL Storage Yard

Site ST005, the POL Storage Yard, is a former aboveground tank farm located east of the flight line and west of Andrews Road. The POL Yard, which is about 12 acres in size, was used to store JP-4 fuel, motor gasoline and fuel oil. The facility was closed in 1994 and in 1996 most of the aboveground storage tanks (AST) and structures were demolished. No surface water bodies or sediments exist onsite. The remaining volume of contaminated soil is estimated to be 3,200 cubic yards.

2.1.2 OU-2 (Groundwater)

The groundwater beneath each of the six (6) sites was found to be contaminated with VOCs including primarily TCE, cis-1,2- DCE, and vinyl chloride. It is likely that groundwater contamination originates from the storage or handling of solvents that were routinely used to clean oily machine parts. The locations of each OU-2 site are displayed in Figure 2-3. Figures 2-6 through 2-11 illustrate the residual contamination remaining at the sites.

2.1.2.1 SS003—Oil Saturated Area

Site SS003, the Oil Saturated Area, is located in the southern part of the Base, south of 155th Street and southwest of Building 704. The site is paved and flat, and a grassy swale runs parallel to the west and south fence lines. No surface water or sediment exist onsite.

The site is adjacent to a former waste oil storage area that was used from the mid-1950s to the late-1980s. Former activities at the storage area are considered a likely source of the groundwater contamination. Based upon the October 2003 QGM data, the estimated area of contaminated groundwater is 0.27 acre. Please refer to Figure 2-6 below.

2.1.2.2 SS006—Hazardous Material Storage Area

Site SS006, the Hazardous Material Storage Area, is located in the west central part of the installation, east of Hanger Road and north of 155th Street. The site is unpaved and slopes downhill to the east from the former hazardous materials storage area. No surface water or sediment exist onsite.

The site is adjacent to a former aircraft engine maintenance shop. Records indicate that a spill occurred in the 1980s resulting in a visible area of discolored vegetation. The spill is considered the source of the groundwater contamination at the site. Based upon the October 2003 QGM data, the estimated area of contaminated groundwater is 5.50 acres. Please refer to Figure 2-7 below.

2.1.2.3 SS009—Fire Valve Area

Site SS009, the Fire Valve Area, is located in the southeast part of the installation, on the southwest side of Building 605, near the intersection of Westover and Corkill Roads. The site is located on the roadside of a paved parking lot next to a fire valve and adjacent to a small grass drainage swale. The site is generally flat. No surface water or sediment exist onsite.

The source of the VOC groundwater contamination is unclear, but may be related to spills that entered the drainage swale adjacent to the fire valve. Based upon the October 2003 QGM data, the estimated area of contaminated groundwater is 0.68 acre. Please refer to Figure 2-8 below.

2.1.2.4 SS012—Communications Facility at Building 105

Site SS012, the former Communications Facility at Building 105, is located in the southeast part of the installation, on the northeast corner of the intersection of 155th Street and Maxwell Avenue. A grassy field lies to the east of the building and extends to a small, unnamed pond constructed about 10 years ago, located about 600 feet east of the site.

The VOC contamination in groundwater is present in the vicinity of a former UST. However, records indicate that the UST stored heating oil, not solvents. Because of this, the source of VOCs in groundwater has not been determined. Based upon the October 2003 QGM data, the estimated area of contaminated groundwater is 3.4 acres. Please refer to Figure 2-9 below.

2.1.2.5 ST005—POL Yard

Site ST005, the POL Yard, is a former tank farm located east of the flight line and west of Andrews Road. The POL Yard began operation in 1954 as the main receiving, storage, and dispensing facility for various fuels, oils, and lubricants used by the Base and its support services. Please refer to Section 2.1.1.2 for more details.

Because of its past use as a fuel storage facility, it is likely that solvents were used onsite to help maintain and clean machinery. It is probable that inadvertent spills and leaks occurred during the lifetime of the facility, particularly in the vicinity of the pump house. It is likely that these releases resulted in the groundwater contamination. Based upon the October 2003 QGM data, the estimated area of contaminated groundwater is 0.85 acre. Please refer to Figure 2-10 below.

2.1.2.6 ST011—UST-620A (Former CS004)

Site ST011, the UST-620A, is located in the east-central part of the Base. The site lies at the northwest corner of Building 620 and is flat and unpaved. No surface water or sediments exist onsite.

The former UST was used between 1966 and 1988 to receive waste liquids from the adjacent Air Force fuel-testing laboratory. It is likely that the former UST represents the source for the groundwater contamination. Based upon the October 2003 QGM data, the estimated area of contaminated groundwater is 0.11 acre. Please refer to Figure 2-11 below.

2.2 Site History and Enforcement Activities

Site management decisions have been made by the BCT, which includes USAF, USEPA, and MDNR representatives.

The history of environmental actions at each remaining OU site is described below. The sites are presented alphabetically with their OU designations provided in parentheses. Details of contaminant distribution are provided later in Section 2-5.

2.2.1 FT002—Fire Training Area (OU-1)

FT002 was constructed in 1965-for fire department training and the storage of combustible materials. From 1965 to 1969, waste oils, solvents, and fuels were routinely stored onsite and burned in an unlined pit. The facility was upgraded in 1969 with a 100-foot-diameter inwardly sloping concrete slab with a 6-inch retaining curb to contain the combustible fuel. A drain in the center of the pad collected liquid residues and conveyed them to an OWS about 50 feet east of the pad. The OWS discharged to the surface along the east side of the site. The fuel for the fire training exercises was stored in a 5,000-gallon AST southwest of the concrete pad. After upgrades were made to the pit, JP-4 fuel was the only flammable liquid used in training exercises.

In 1988, the 5,000-gallon AST was removed when training exercises were discontinued. The OWS was filled with concrete and abandoned in place and its associated holding tank was removed. The buried product and dispensing lines were cleaned, flushed with potable water, and vented in 1996 (Dames & Moore, 1996a). It is believed that the AST, buried pipe lines, burn activities prior to pad construction, and the OWS tanks and outfall contributed to the oddly shaped area of soil contamination at FT002.

The site was initially investigated in 1988 (Ecology & Environment, 1988). Three (3) monitoring wells were installed. Soil samples were collected and analyzed for TPH compounds and VOCs. Groundwater samples were collected and analyzed for VOCs only. In 1989, four (4) additional monitoring wells were installed (O'Brien & Gere, 1991). Soil and groundwater samples were analyzed for VOCs, semivolatile organic compounds (SVOC), and metals.

The site was further investigated during the 1999-2000 Basewide RI and RI Addendum to support a risk-based site management decision (CH2M HILL, 2001 a). In 1999, seven (7) soil borings were advanced at FT002. Eleven (11) soil samples were retained for laboratory analyses. One (1) monitoring well, MW-001, was installed in one of the borings. Soil and groundwater samples were analyzed for TPH, VOCs, SVOCs, polychlorinated biphenyls (PCB), and metals. Select soil samples were also analyzed for dioxins/furans. In 2000, 20

direct-push soil borings were advanced across the site. Three (3) soil samples were retained from each boring for analysis of TPHs and VOCs. The uppermost soil sample from each boring was also analyzed for dioxins/furans. In addition, a groundwater sample was collected from well MW-001 and analyzed for VOCs.

Following the RI, the majority of contaminated soils at the site was excavated and disposed of at an offsite landfill as part of the OU-1 IRAs. Remaining site structures were also removed and the site backfilled, re-graded, and seeded. Details of the IRA effort are provided in the Interim Action Report for OU-1 (CH2M HILL, 2003b).

2.2.2 SS003—Oil Saturated Area (OU-2)

Site SS003 was used to store waste oil products generated by maintenance of Motor Pool vehicles from the mid-1950s to the late 1980s (USAF, 1994). It is part of the former waste oil storage area and originally covered approximately 1,600 square feet (Versar, 1996).

SS003 was initially identified during a Phase I Records Search of the former Richards- Gebaur AFB (CH2M HILL, 1983). The site was recognized at that time as being oil-stained. The site was further investigated in 1986 when soil and surface water samples were collected and analyzed (Ecology and Environment, 1988). Two (2) additional field samples were collected in 1989 as part of a Remedial Investigation (O'Brien and Gere, 1991). In 1991, approximately 42 cubic yards of contaminated soil was removed from SS003 (Burns and McDonnell, 1992a). In February 1992, an additional 15 cubic yards of soil were excavated from SS003. Two (2) post-excavation soil samples were taken from the undisturbed subsurface soil. In 1996, a groundwater assessment was conducted at the site (Versar, 1996). Three (3) monitoring wells were installed.

The site was further investigated during the 1999-2000 Basewide RI to support a risk-based site management decision (CH2M HILL, 2001a). During the Basewide RI, five (5) additional groundwater-monitoring wells were installed. Three (3) soil samples were collected from the well boreholes. Groundwater samples were collected from the new wells and from three (3) existing wells at the site. Soil and groundwater samples were analyzed for TPH, VOCs, SVOCs, and metals. In July 2003, two (2) additional wells were installed.

2.2.3 SS006—Hazardous Waste Materials Area (OU-2)

Site SS006 lies off the northeast corner of Building 927, which was used as an aircraft engine and propeller maintenance shop from 1957 to 1994. An area outside the rear of the building was used to keep bulk supplies of degreasers, solvents, oils and other common workshop materials. The materials were routinely stored in 55-gallon drums or other containers and placed off the ground on racks.

SS006 was initially identified during a Site Inspection (SI) in 1990. According to records, the grass immediately behind the storage racks was discolored and showed signs of stress. In response, two (2) surface soil samples were collected as part of a Preliminary Assessment (PA) (O'Brien and Gere, 1991). Additional field samples were collected in 1991 during an Installation Restoration Program (IRP) SI (Burns and McDonnell, 1993). At the time of the inspection, the storage rack had been removed and signs of stressed vegetation were absent. Subsequently, in 1993, approximately 40 cubic yards of contaminated soil were removed from SS006 (Burns and McDonnell, 1993). Following the soil removal, a groundwater assessment was conducted at the site (Versar, 1996).

The site was further investigated during the 1999-2006 Basewide RI and a 2001 RI Addendum (CH2M HILL, 2001a and 2002c). During the Basewide RI, 14 monitoring wells were installed at the site in three (3) separate phases of fieldwork conducted between May and August 2000. During this period, eight (8) soil samples from the well borings were retained for laboratory analyses, and groundwater samples were collected from the monitoring wells. Soil and groundwater samples were analyzed for TPH, VOCs, SVOCs, and metals.

Because of the elevated VOC concentrations found in four perimeter wells in October 2000, the site was further investigated to delineate the groundwater contamination. As part of the RI Addendum, six (6) monitoring wells were installed in two (2) separate phases of fieldwork conducted between January and October 2001. During that period, two (2) soil samples from the well borings were retained for laboratory analysis. Groundwater samples were collected from five (5) of the six (6) monitoring wells (one well was dry). The samples were analyzed for VOCs. In July 2003, two (2) additional wells were installed.

2.2.4 SS009—Fire Valve Area (OU-2)

Site SS009 was part of the Civil Engineering Complex and was in use by the Air Force from 1955 until 1994. The United States Marine Corps (USMC) currently uses the building. During the Air Force's occupancy, the building was used for various purposes, including a Carpenter Shop, Interior and Exterior Heat Shop, Roads and Grounds Shop, and Sanitation Shop (Tetra Tech, 1995). Reportedly, no activities at the complex involved the storage or handling of bulk hazardous waste materials (USAF, 1993).

The site was initially identified in 1992 when an Air Force contractor reported petroleum product while repairing an underground water main valve (USAF, 1993). As a consequence, approximately 10 cubic yards of petroleum-contaminated soil were excavated from the site in 1993. In 1994, a total of 70 soil samples were collected from the site and field-screened prior to possible laboratory analyses during a Preliminary Assessment/Site Inspection (PA/SI) (Tetra Tech, 1995). A groundwater assessment was also conducted at the site to evaluate potential adverse impacts to shallow groundwater (Versar, 1996).

The site was further investigated during the 1999-2000 Basewide RI. In 1999, two (2) groundwater-monitoring wells were installed. Two (2) groundwater and three (3) soil samples were collected and analyzed for TPH, VOCs, SVOCs, and metals. Because of dry conditions, one (1) monitoring well borehole was abandoned. Results of the 1999 investigation revealed the presence of chlorinated VOCs in groundwater. Consequently, 10 additional monitoring wells were installed. Each well was sampled for VOCs in June 2000. In July and August 2003, three (3) additional wells were installed.

2.2.5 SS012 Communication Facility at Building 105 (OU-2)

Site SS012 was used as a communications facility from 1954 to 1994. One (1) former 250- gallon UST was used to provide diesel fuel to a backup electric generator located inside Building 105. The UST was removed in 1988 and replaced by a 275-gallon AST for diesel fuel (Booz-Allen & Hamilton, 2000).

In 1996, a subsurface assessment was conducted at site SS012 (HDB, 1996). Two (2) soil borings were advanced near the former UST. One (1) soil sample was retained from each boring corresponding to the depth interval between 13 and 15 feet below ground. The soil samples were analyzed for VOCs, polyaromatic hydrocarbons (PAH), and TPH-diesel range organics (DRO). In addition, one (1) grab groundwater sample was collected from a

borehole and analyzed for the same set of parameters as those of the soil samples. An Environmental Baseline Survey (EBS) was performed at the site in August 2001 (CH2M HILL, 2002e). Four (4) direct-push soil borings were collected around the former UST and existing AST. Soil samples from each boring were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), TPH-gasoline range organics. (GRO) TPH-DRO, VOCs, and PAHs.

Results of the 1996 investigation were found during a records search associated with the EBS Project in 2000, prompting a 2001 RI Addendum investigation at the site to support a risk-based site management decision. During the RI Addendum, 12 monitoring wells and nine (9) temporary piezometers were installed. Five (5) soil samples were collected from three (3) well boreholes near Building 105. Groundwater samples were collected from the 12 wells and from six (6) of the nine (9) piezometers. The soil and groundwater samples were analyzed for VOCs. Soil and groundwater samples collected from MW-001 also were analyzed for TPH.

2.2.6 ST005—POL Storage Yard (OU-1 and OU-2)

The POL Yard began operation in 1954 as the main receiving, storage, and dispensing facility for various fuels, oils, and lubricants used by the Base and its support services. Two (2) former hydrant fuel systems were used to distribute fuel from the POL Yard to the flight line underground storage tanks. One (1) system transported aviation gasoline and, later, JP-4 fuel to a truck fuel stand (Facility 941) located 1,200 feet west of the POL Yard at the east end of the flight line. The other transported JP-4 fuel to the four (4) former USTs at Building 902, which provided fuel to six (6) flight line fueling stations or pits.

In 1985, an AST (Facility 956) and a pump house (Facility 959) on the northeastern part of the POL Yard were sold to the Kansas City Aviation Department. These structures are formerly used defense sites and are no longer the responsibility of the Air Force. The POL Yard ceased operation in 1994 and was decommissioned in 1996. Most structures, including underground piping and piping headers, were demolished and removed from the POL Yard in 1996 (Dames & Moore, 1996b). As part of the demolition, 200 cubic yards of soil and building debris were disposed at an offsite landfill. The two (2) structures owned by Kansas City Aviation Department (Facilities 956 and 959) were decommissioned in January 2001 and removed between November 2000 and January 2001. Various environmental investigations were performed at the site and are summarized below.

Prior to the 1999-2000 Basewide RI at the base, soil and groundwater sampling was performed at ST005 by Ecology and Environment (1988), O'Brien & Gere (1991), United States Army Corps of Engineers (1989), Burns & McDonnell (1992), and Dames & Moore (1996b). Soil samples collected during these investigations were analyzed for TPH, BTEX, VOCs, SVOCs, and metals. In 1996, Dames & Moore conducted a Phase II Site Characterization at ST005. Three hundred and fifty-five (355) soil samples were collected from across the site and analyzed for TPH, BTEX, SVOCs, and lead.

The site was then investigated during the 1999-2000 Basewide RI to support a risk-based site management decision. In 1999, seven (7) soil borings were advanced. Twenty-four (24) soil samples were collected. Groundwater samples were collected from each of 17 existing monitoring wells at the site. Soil and groundwater samples were analyzed for TPH- GRO, TPH-DRO, VOCs, SVOCs, and metals. Elevated concentrations of chlorinated VOCs had been detected in one (1) monitoring well on the northeastern part of the site.

To delineate the VOC contamination, additional 14 monitoring wells were installed. Soil and groundwater samples were collected for VOCs analyses. To delineate the residual soil contamination, 72 direct-push soil borings were advanced in 2000. Three (3) soil samples were retained from each boring for laboratory analyses of TPH, VOCs, and SVOCs. In July 2003, three (3) additional wells were installed.

2.2.7 ST011-UST-620A (0 U-2)

Site ST011 is a former UST site. Records indicate that a UST was installed adjacent to Building 620 in 1966. The exact size of the UST cannot be determined due to conflicting document information. Historical records suggest that the UST capacity was either 260 gallons or 550 gallons (Dames & Moore, 1996c). The former UST was used between 1966 and 1988 to receive waste liquids from the adjacent Air Force fuel testing laboratories.

The UST was removed in 1988. Low levels of TPH compounds were measured in a single soil sample collected from the excavation during the tank removal. Additional soil samples were collected in 1993 as part of the UST closure activities for the Base at large (Burns & McDonnell, 1994) and in 1995. The analytical results indicated that the former UST area contained TPH compounds in soil above the applicable state action levels.

As a result, about 50 cubic yards of soil were excavated in 1995 (Dames & Moore, 1996c). Three (3) post-excavation soil samples were collected. In 1996, two (2) additional soil samples were collected at the site as part of a Subsurface Assessment (HDB, 1996).

The site was further investigated during the 1999-2000 Basewide RI. Three (3) groundwater-monitoring wells were installed. Three (3) groundwater samples and five (5) soil samples were collected and analyzed for TPH, VOCs, SVOCs, and metals. Preliminary results of the 1999 investigation revealed chlorinated VOCs in groundwater. Consequently, to better delineate groundwater contamination, 13 additional monitoring wells were installed, and three (3) soil samples were retained. Soil and groundwater samples were analyzed for VOCs. In July 2003, one (1) additional well was installed.

2.3 Community Participation

Regulations under CERCLA require a number of public participation activities to occur before and at the completion of the ROD (e.g., 40 CFR § 300.430(f)(3); see also "Community Relations Superfund: A Handbook" (USEPA, 1992)). To meet these obligations, USAF, USEPA, and MDNR regularly provide the community information regarding the cleanup of sites at the former Richards-Gebaur AFB through quarterly meetings of the Restoration Advisory Board (RAB), the public Information Repository, and various announcements, fact sheets, and public notices published in the local newspapers and other media.

The RAB was formed in February 1994 and held its first meeting on March 1, 1994. The RAB was formally adjourned in November 2003 with concurrence from all members. The RAB ensured that the community was aware of and also had a voice in environmental restoration issues at the Base. The group met quarterly and assisted the BCT by providing community input on cleanup priorities (USAF, 1994). Information regarding work at the former Richards-Gebaur AFB and other environmental issues was regularly available through the RAB process that existed from 1995 through 2003.

The Basewide RI Report, EE/CA Report, FS Report, FFS Report, and Proposed Plan for the former Richards-Gebaur AFB have been readily available to the public. The selected final remedies for both OUs were identified in the Proposed Plan that was presented in the public participation process. The full-length reports can be found in the Administrative Record file at the Grandview Mid-Continent Public Library in Grandview, Missouri.

Availability of the EE/CA Report was published in the Belton Star Herald on May 31, 2001. The formal comment period extended from June 1, 2001 to June 30, 2001. In addition, a Public Availability Session was held on June 14, 2001 to present the remedial alternatives for OU-1 sites where soils or sediments were contaminated by hydrocarbons or metals.

After the 2001 IRA, the USAF published another notice of the availability of the Proposed Plan in December 2002. The notice announced the 30-day public comment period from December 9, 2002 to January 9, 2003. In addition, a Public Availability Session was held on December 12, 2002 to present the Proposed Plan to the interested community members, government officials, elected officials, media, and private organizations. At this meeting, representatives from the BCT answered questions about the site contamination and the recommended remedial alternatives. The BCT also used this meeting to solicit a wider cross-section of community input on the reasonably anticipated future land use and potential beneficial groundwater uses at the Base. The Air Force's response to the comments received during the public comment period is included in the Responsiveness Summary, which is provided as Section 3 of the ROD.

2.4 Scope and Role of Operable Unit or Response Action

The proposed remedies in this ROD will be the final actions for the two (2) OU-1 sites with residual petroleum hydrocarbon contamination in soils and the six (6) OU-2 sites with chlorinated solvent contamination in groundwater. As such, the remedies constitute the final actions required at the former Richards-Gebaur AFB to mitigate potential threats to human health and the environment posed by residual contamination at OU-1 and OU-2 sites.

2.4.1 OU-1 (Soils)

Originally, OU-1 consisted of six (6) soil or sediment sites that were contaminated as a result of past activities at the Base. Of the six (6) sites, five (5) had soils or sediments contaminated by petroleum hydrocarbons, PAHs, or both. One (1) site—a former Small Arms Firing Range—had soils contaminated with lead. In 2001, the six (6) OU-1 sites were examined using an EE/CA to help identify the most effective method of site restoration (CH2M HILL, 2001 b). The outcome of the EE/CA was a recommendation to excavate the contaminated soil or sediment and dispose of it at an appropriately permitted landfill.

Four (4) of the six (6) OU-1 sites were successfully remediated by performing the IRA and now require no further action (CH2M HILL, 2003b). For the remaining two (2) sites: FT002 and ST005, the IRAs removed the majority of the contamination. However, several isolated sample locations remain with TPH concentrations above the unrestricted land use level of 200 ppm. Accordingly, further remedial options for managing potential human health and environmental risks at FT002 and ST005 were evaluated as part of an FFS (CH2M HILL, 2002a).

This ROD presents the final response action for the two (2) OU-1 sites, FT002 and ST005. It addresses residual soil contamination by imposing enforceable LUCs to prohibit residential land use and prohibit excavation of site areas where petroleum hydrocarbon

contamination remains at concentrations above MDNR's unrestricted land use criterion for, TPH of 200 ppm.

2.4.2 OU-2 (Groundwater)

OU-2 consists of six (6) groundwater sites: SS003, SS006, SS009, SS012, ST005, and ST011. VOCs such as TCE, DCE, and vinyl chloride, are the common contaminants in groundwater at these sites. Remedial action alternatives for the groundwater sites were evaluated as part of an FS (CH2M HILL, 2002b).

This ROD presents the final response action for the six (6) OU-2 sites and addresses the groundwater contamination by imposing LUCs to prohibit extraction and use of the contaminated groundwater at these sites. In addition, a LTM program will be implemented by the Air Force to systematically examine water quality at each site and to ensure that the LUC boundaries fully encompass the areas of groundwater contamination at each site. The LTM program will also identify changes in contaminant concentrations or distribution and will be used to support a decision for expanding or terminating LUCs (see Section 2.14). The LUCs (including deed restrictions or use restrictions for property remaining within federal control) will ensure that groundwater at the six (6) sites cannot be extracted or used by future landowners or residents.

2.5 Site Characteristics

This section describes the pertinent physical and chemical characteristics of the overall setting of the former Richards-Gebaur AFB. This is followed by a detailed overview of the nature and extent of contamination at the two (2) OU-1 sites and the six (6) OU-2 sites.

Site-specific environmental sampling data from the Basewide RI, RI Addendum, and QGM program were used to evaluate the nature and extent of the contamination. Post-excavation sampling results from the 2001-2002 IRA were also used to accurately describe the current environmental site conditions at the FT002 and ST005 following completion of IRAs at these sites.

2.5.1 Physiography and Climate

The former Richards-Gebaur AFB is located within the Osage Plains region of the Central Lowlands physiographic province. The Osage Plains are characterized by low relief, wide, maturely dissected uplands, and relatively steep valley slopes carved on sedimentary rocks of Pennsylvanian age. The topography of the Base is gently rolling, with relief between 960 and 1,060 feet above mean sea level (Versar, 1996).

The mean monthly temperature at the Base is 54.9°F, ranging from 28°F in January to 79°F in July. The average annual precipitation is 37.9 inches, with the majority typically occurring in the late spring, early summer and early fall, when warm, wet air currents from the Gulf of Mexico collide with cold, dry continental air from Canada. The average snowfall is 21.6 inches, but historically has varied from less than 12 inches to over 60 inches in depth.

2.5.2 Geology

The unconsolidated surficial materials at the Base consist of red-brown residual clays containing abundant chert fragments derived from in situ weathering of the near-surface limestone bedrock. At higher elevations, wind-blown silt deposits sometimes overlie the residual clays. The unconsolidated materials overlying the bedrock range in thickness from

zero to 20 feet (Gentile, 1998). The soils belong to the Macksburg-Urban Series and are characterized as poorly drained silt and silt-clay loams (Versa, 1996).

The geology at the former Richards-Gebaur AFB consists of interbedded limestones and shales belonging to the Kansas City Group of the Missourian Series, Pennsylvanian System. The local bedrock consists of cyclical or repetitive sequences of relatively thin beds of limestone and shale with minor amounts of sandstone, siltstone, and conglomerate. Individual rock units are not more than 40 feet thick. The combined thickness of rock units exposed at the Base is about 140 feet, extending from Scope Creek in the northeast part of the Base to the top of the highest hill at the south boundary of the Base. The Kansas City Group comprises the following formations, listed from the surface downward: Wyandotte, Lane, Iola, Chanute, Drum, and Cherryvale. The Wyandotte, Lane, Iola, and Chanute formations are exposed at several locations on the Base, and are described in detail below. Figure 2-3 presents a stratigraphic section of the geologic units exposed at the Base (Gentile, 1998).

The uppermost bedrock unit is the Argentine Member of the Wyandotte Formation, which crops out at higher elevations. It consists of well-jointed light gray limestone characterized by thin, wavy bedding and is roughly 30 to 35 feet thick. Exposed Argentine limestone develops solution cavities, and existing joints can be enlarged to several feet in width. The solution-widened joints extend throughout the Argentine Member and are commonly filled with red clay and chert fragments.

Beneath the Wyandotte Formation (Argentine Limestone) is the Lane Formation. The Lane Formation consists of a medium-gray to bluish-gray shale that is commonly silty to sandy in the upper part. The Lane Shale typically is 25 to 40 feet thick and is considered relatively impermeable, forming a barrier to vertical groundwater flow (Gentile, 1998).

The Iola Formation occurs below the Lane Formation and is primarily limestone with a thin bed of shale at its base. At the Base it has a maximum thickness of 10 feet. The upper member of the Iola Formation is the Raytown Limestone Member, generally a massive bluish-gray, wavy bedded limestone ranging from 6 to 8 feet in thickness and locally containing interbedded lenses of shale roughly 3 inches thick. The upper two (2) or three (3) feet of the Raytown Limestone Member is massive and weathers to a deep red-brown color. However, unlike the Wyandotte Formation limestone, the Raytown Limestone Member is a hard, finely crystalline rock that is not readily susceptible to solution weathering. The Raytown Member passes downward into a thin shale (Muncie Creek Member) and a second limestone band, known as the Paola Limestone Member before giving way to the Chanute Shale.

The Chanute Formation underlies the Iola and is a maroon and green claystone and shale with local occurrences of cross-bedded sandstone and conglomerate. The formation ranges from 25 to 30 feet in thickness and consists of an upper gray shale overlying two (2) or three (3) feet of hard, resistant sandstone near its top, and maroon to greenish-gray shales interbedded with a thin nodular limestone near the middle. About 10 feet of greenish-gray shale lies at the base of the formation. The high percentage of shale and claystone and the tightly cemented sandstone in the upper part of the formation prevents the Chanute Formation from transmitting significant amounts of fluids (Gentile, 1998).

2.5.3 Structural Geology

The Kansas City Group geologic units underlying the Base have been gently folded into a series of synclines, domes, and anticlines that, taken overall, dip north-northwest at about

10 feet per mile. Subsurface water that becomes perched on top of impermeable shale units would tend to drain in a generally north or northwesterly direction (Gentile, 1998).

The limestone formations are well jointed. The regional joint pattern consists of two (2) major sets that trend NE—SW and NW—SE and is essentially vertical, oriented almost at right angles to one another (Gentile, 1991). It is these joints that weather to form solution channels that are the principal conduits for groundwater flow within limestone at the Base.

2.5.4 Hydrogeology

The former Richards-Gebaur AFB is located in the Osage Plains groundwater province of the Central Lowland-Nonglaciated Plains region. Groundwater in the Osage Plains province occurs in sedimentary aquifers of Pennsylvanian and Mississippian age. Yields reportedly range from one (1) to 20 gallons per minute (gpm), although regionally the Pennsylvanian- age geologic units act as a confining unit because of the thick sequences of impermeable strata that make up the formations.

The presence of shallow groundwater in unconsolidated overburden soils and weathered near-surface bedrock is largely dependent on seasonal rainfall. Groundwater collects and resides in the transition zone between soil and weathered bedrock. The combination of clay overburden, fractured limestone, and relatively impermeable shale results in subsurface conditions with limited opportunity for vertical groundwater movement. Low flow velocities predominate and near stagnant groundwater conditions are common during dry periods, as demonstrated by numerous site wells that can take days or weeks to recharge following bailing and sampling.

Groundwater at the Base may be classified as moderately saline, sodium-chloride type, particularly with regard to Pennsylvanian-age (e.g., Kansas City Group) geologic units near the surface. Regionally, total dissolved solids (TDS) range from 330 ppm to 7,000 ppm because of naturally occurring high concentrations of sodium and chloride (MDNR, 1997). As part of the RI, nine groundwater samples from several sites were tested for TDS. The results indicated that TDS concentrations in Base groundwater varied from 362 to 1,116 ppm, consistent with regional values for naturally occurring groundwater quality. The wide range of TDS concentrations reflect the relative proximity of wells to the freshwater/saline water interface that runs southwest northeast through the province. The recommended USEPA Secondary Maximum Contaminant Level for TDS is 500 ppm.

According to MDNR, because of poor groundwater quality in Cass, Johnson, Jackson, Lafayette, and Saline counties, sources other than groundwater are used for public water supplies. Records show that most of the groundwater production wells in the area were drilled deeper than 250 feet to produce reliable yields of quality water. The minimal use of groundwater contributes to the lack of groundwater quality data for the region (MDNR, 1997). Accordingly, there are no currently complete exposure pathways for contaminated groundwater at the Base because no active water supply wells exist in the area. Available information indicates that there are unlikely to be potentially complete exposure pathways to VOCs in groundwater for potential future residents.

The Base and nearby communities of Belton, Pleasant Hill, and Grandview obtain their domestic water supply from the Kansas City Water and Pollution Control Department. The former municipal well field at Belton was abandoned several decades ago when supplies of Missouri River water became available to residents through the Kansas City Water and Pollution Control Department.

2.5.5 Surface Water

At the former Richards-Gebaur AFB, surface runoff usually drains south and east in several small, unnamed streams. Most of these small streams flow down gradient toward Scope Creek (see Figure 2-2) while a few do not reach Scope Creek. Scope Creek is an intermittent stream that carries water most of the time. It flows diagonally from southwest to northeast, past the Small Arms Firing Range and offsite south of the intersection of State Highway 150 and US Route 71, terminating in the Little Blue River.

A number of small streams in and around the Base have been dammed, creating several man-made ponds. Currently, only one (1) pond exists at the base. The pond lays several hundred feet east of SS012 (formerly Building 105).

2.5.6 Nature and Extent of Contamination—OU-1 (Soil)

This section presents a summary of the nature and extent of contamination remaining at the two (2) OU-1 sites and the six (6) OU-2 sites. Note that for the OU-1 sites, the nature and extent of contamination reflects post IRA site conditions. Accordingly, post-excavation sampling results from the 2001-2002 IRA were used to accurately describe the current environmental site conditions at FT002 and ST005 and the locations of the residual petroleum hydrocarbon contamination in soils at the two (2) sites.

2.5.6.1 FT002—Fire Training Area

Following the RI, because of the human health risk associated with benzene and PAHs in the site soil and the elevated concentrations of petroleum hydrocarbons in soils, an IRA was conducted at FT002 between October 2001 and August 2002 (CH2M HILL, 2003b). As a result, a total of 6,570 cubic yards of contaminated soil were excavated. One hundred and seventeen (117) post-excavation confirmation samples were collected and analyzed for PAHs, TPH, VOCs, and BTEX. Analytical results indicated that with the exception of four (4) isolated sample locations with TPH concentrations above MDNR's residential land use RACG for TPH of 200 ppm, all contaminated soil was successfully removed through the IRA.

Consequently, the nature and extent of residual contamination at FT002 is limited to four (4) soil sample locations. Three (3) locations remain where residual hydrocarbon concentrations exceed the unrestricted land use RACG (TPH = 200 ppm) at the surface or within the top three (3) feet of soil, and one (1) location (at a depth of 18 feet) remains where the residual TPH concentration exceeds MDNR's commercial-light industrial land use RACG (TPH = 500 ppm). Please refer to Figure 2-4 for a depiction of the residual contamination at FT002.

2.5.6.2 ST005 - POL Storage Yard

Following the RI, because of the human health risk associated with benzene and PAHs in the site soil, and based on the presence of elevated concentrations of TPH compounds in soils, an IRA was conducted at ST005 between November 2001 and August 2002. As a result, a total of 20,164 cubic yards of contaminated soil were excavated. Two hundred and thirty one (231) post-excavation confirmation samples were collected and analyzed for PAHs, TPH, and BTEX. Analytical results indicated that with the exception of 26 sample locations, all contaminated soil was successfully removed through the IRA.

Consequently, the nature and extent of residual contamination at ST005 corresponds to the 26 sample locations where residual hydrocarbon concentrations exceed the residential

RACG (TPH = 200 ppm). Six (6) of the locations exist within the upper three (3) feet of soil but at concentrations below the commercial-light industrial RACG for TPH of 500 ppm. The 26 locations of residual hydrocarbon contamination in soil at ST005 are depicted in Figure 2- 5.

2.5.7 Nature and Extent of Contamination - OU-2 (Groundwater)

The COCs in groundwater consist of chlorinated VOCs such as tetrachloroethene (PCE), TCE, cis-1,2-DCE, 1,1-DCE, and vinyl chloride. TCE, the primary COC, was common in the groundwater at each OU-2 site. Cis-1,2-DCE and vinyl chloride are also present in groundwater beneath most of the OU-2 sites at concentrations exceeding RACGs. In addition, PCE and 1,1-DCE were detected at elevated concentrations at site SS009. No other VOCs are present. Table 2 in Section 2.10.3 lists the applicable RACGs for groundwater.

The occurrence of COCs in groundwater at each OU-2 site is presented below. Please note that data from the ongoing QGM program for OU-2 is also referenced (groundwater monitoring has been conducted at each of the sites on a quarterly basis since the RI was conducted in 1999-2000 to determine any trends in contaminant concentrations). Results from the October 2003 QGM are presented in Figures 2-6 through 2-11.

2.5.7.1 SS003—Oil Saturated Area

Ten (10) monitoring wells have been installed at SS003. Sampling results from the 1999- 2000 Basewide RI indicated that TCE was detected at concentrations exceeding its RACG in four (4) wells: MW-004, MW-006, MW-007, and MW-008. TCE concentrations in these wells ranged from 5.2 ppb at MW-008 to 60.3 ppb at MW-004. The VOCs, cis-1,2-DCE and vinyl chloride, were detected, but at concentrations below the applicable RACGs. The TCE contamination is limited to a small area west and south of Building 704, and covers about 0.27 acre.

Groundwater generally flows to the east and southeast through a silty clay/weathered shale transition zone. The hydraulic gradient appeared to be higher in the western part of the site (0.069 ft/ft) than in the eastern part (0.017 ft/ft). Based on aquifer test data from July 2000, flow velocities in the weathered zone ranged from 0.0022 ft/day to 0.028 ft/day.

Because of the elevated TCE concentrations in groundwater, the site has been included in the QGM program since June 2000 (CH2M HILL, 2000 -2003). Based on these QGM results, it appears that the TCE plume in groundwater remains stable, and that the extent of groundwater contamination at the site is sufficiently delineated. Furthermore, because of the very low groundwater flow velocities at the site, the potential for future down gradient transport of contaminants is low. Figure 2-6 presents the October 2003 QGM analytical results.

2.5.7.2 SS006—Hazardous Waste Material Storage Area

Twenty-three (23) monitoring wells have been installed at SS006. Sampling results from the 1999-2000 Basewide RI indicated that TCE was detected at concentrations exceeding its RACG in nine (9) wells with concentrations ranging from 6.2 ppb to 507.4 ppb. Cis-1,2-DCE was detected above its RACG in four (4) wells with concentrations ranging from 70.1 F ppb to 178.9 ppb, and vinyl chloride was detected above its RACG in six (6) wells with concentrations ranging from 3.9 ppb to 97.1 J ppb. The contamination extends hydraulically down gradient, east of the site and, to a lesser extent, south of the site. Because of the

elevated VOC concentrations in groundwater, the site has been included in the QGM program since June 2000 (CH2M HILL, 2000 -2003). The=area-of contaminated groundwater is estimated to be 5.50 acres.

During the October 2000 QGM, four (4) perimeter wells that previously had been dry for almost one year since installation (MW-013 through MW-016) produced water for the first time and thus were sampled. Following the October 2000 sampling, TCE was found to be present in MW-015 at a concentration exceeding its RACG of 5 ppb. However, no VOCs were detected in the other three (3) perimeter wells.

During the January 2001 QGM, two (2) of the perimeter wells found to be free of TCE in October 2000 (MW-013 and MW-014) also showed TCE concentrations exceeding the 5 ppb RACG. Consequently, to further delineate the VOC impacts at the site, six (6) more monitoring wells were installed at SS006 in two (2) separate phases of fieldwork conducted between February 2001 and October 2001. The six (6) wells are designated MW-019 through MW-024. The wells were positioned in and around the perimeter fence surrounding Facility 931, a former liquid oxygen storage area. Facility 931 lies roughly 600 feet to the east of the hazardous material storage area behind Facility 927.

TCE was not detected at concentrations exceeding the RACG of 5 ppb in five (5) of the six (6) new wells. However, well MW-020, located adjacent to Facility 931, exhibited the highest concentration of TCE at the site: 930 ppb. It is likely, therefore, that the area surrounding MW-020 (corresponding to Facility 931, a former Liquid Oxygen Storage Area) represents an isolated hotspot unrelated to the main area of groundwater contamination that originates from Building 927. Also, unlike other wells, TCE concentrations at MW-020 have shown an increasing trend over time.

Groundwater at SS006 flows southeast at a hydraulic gradient of 0.11 ft/ft. Based on aquifer tests performed in July 2000, flow velocities ranged from 0.045 ft/day to 0.21 ft/day at higher elevations where fracture limestone was encountered several feet below ground surface. At lower elevations where the limestone is absent (e.g., near Facility 931), the flow velocity in the overburden ranged from 0.0001 ft/day to 0.014 ft/day.

Based on the historical QGM results, the concentrations of COCs in the majority of wells appear consistent over time, with the sole exception of MW-020, which shows increasing concentrations and appears to be an anomaly compared to other QGM results. Because of the relatively low groundwater flow velocities at the site, the potential for future further down gradient transport is low. In conclusion, the monitoring well network at SS006 adequately delineates the extent of VOCs in groundwater at the site based on QGM results. Figure 2-7 presents the October 2003 QGM analytical results.

2.5.7.3 SS009—Fire Valve Area

Thirteen (13) monitoring wells have been installed at SS009. Sampling results from the 1999-2000 Basewide RI indicated that VOCs exceeded the corresponding RACGs in two (2) shallow wells: MW-003 and MW-009. Five (5) VOCs were detected in well MW-003 at concentrations in excess of the respective RACGs: PCE (58.9 ppb), TCE (34.9 ppb), cis-1,2- DCE (282.3 ppb), 1,1-DCE (106.2 ppb), and vinyl chloride (50.3 ppb). An elevated concentration of vinyl chloride (5.1 J ppb) was also found in the sample collected from MW- 009. The VOCs were detected only in shallow wells, indicating a lack of connection between the shallow and deep wells. The area of groundwater contamination extends in a northwest-southeast direction toward Scope Creek and is approximately 0.68 acre in size.

Groundwater appears to flow east through both the shallow silty clay/weathered shale zone and the lower limestone unit at SS009. The hydraulic gradient of the shallow silty clay/weathered shale zone was estimated to be 0.021 ft/ft. The hydraulic gradient of the limestone was estimated to be 0.052 ft/ft. Based on aquifer tests performed in July 2000, flow velocities in the silty clay were low, on the order of 0.00015 ft/day. Groundwater velocity in the limestone appeared to range from 0.00023 ft/day to 0.0027 ft/day.

Because of the elevated VOC concentrations in groundwater, the site has been included in the QGM program since June 2000 (CH2M HILL, 2000 -2003). Based on these QGM results, it appears that the contaminant plume in groundwater remains stable. The extent of groundwater contamination at the site is sufficiently delineated. Furthermore, because of the very low groundwater flow velocities at the site, the potential for future down gradient transport is low based on QGM results. Figure 2-8 presents the October 2003 QGM analytical results.

2.5.7.4 SS012—Former Communications Facility at Building 105

Twelve (12) monitoring wells have been installed at SS012. Sampling results from the 2001 RI Addendum indicated that TCE and vinyl chloride were found in groundwater samples from SS012 at concentrations between 12 ppb and 1,000 ppb, exceeding their corresponding RACGs of 5 ppb and 2 ppb. TCE exceeded its RACG in six (6) of the 12 monitoring wells. Vinyl chloride, with a concentration of 15 ppb, exceeded its RACG in well MW-001. The highest TCE concentrations consistently have occurred in well MW-002, which is located about 100 feet northeast and hydraulically down gradient of Building 105. The area of groundwater contamination is approximately 3.4 acres, extending from adjacent to Building 105 down slope towards the pond.

Groundwater appeared to flow through the silty clay overburden at SS012 at an estimated hydraulic gradient of 0.03 ft/ft. No aquifer test was conducted at the site. Using hydraulic conductivities for the same formation at an adjacent site, the flow velocity at the site was estimated to range from 0.0002 ft/day to 0.031 ft/day. Because the site sits on a hill, groundwater at the site flows to the north and also east.

Because of the elevated VOC concentrations in groundwater, the site has been included in the QGM program since April 2001 (CH2M HILL, 2000-2003). Based on these QGM results, it appears that the contaminant plume in groundwater remains consistent and that the extent of groundwater contamination at the site is sufficiently delineated. Figure 2-9 presents the October 2003 QGM analytical results.

2.5.7.5 ST005—POL Storage Yard

Thirty-four (34) monitoring wells have been installed at ST005. The 1999-2000 Basewide RI results indicated that TCE is the only COC at the site. Wells installed above a thin (<1-foot thick) shale layer were designated shallow (S), and wells screened below the shale were designated deep (D). The occurrences of TCE were limited to MW-003 and six (6) surrounding monitoring wells: MW-010 (D), MW-012 (S), MW-013 (D), MW-014 (S), MW- 016 (S), and MW-01 8 (S). The TCE concentrations ranged from 6.3 ppb at well MW-010 (D) to 226 ppb at well MW-018 (S). Because TCE was detected in both shallow and deep wells, a hydraulic connection appears to exist between shallow and deep zones. In other words, the thin layer of shale between the shallow limestone and deeper limestone does not act as a confining layer. The estimated area of contaminated groundwater is 0.85 acre, with the main area of contamination located northeast of former POL Yard Pump House (i.e., Facility 959).

In general, groundwater flows southeast at an estimated hydraulic gradient of 0.085 ft/ft. Based on the aquifer tests conducted in July 2000, flow velocities in the shallow silty clay zone were estimated to be 0.00058 ft/day. Groundwater flow velocities in the limestone were estimated to be 0.01 9 ft/day.

Because of the elevated VOC concentrations in groundwater, the site has been included in the QGM program since June 2000. Because of the low groundwater flow velocities at the site, the potential for future further down gradient migration of contaminants is low. Figure 2-10 presents the October 2003 QGM analytical results.

2.5.7.6 ST011—UST-620A

Seventeen (17) monitoring wells have been installed at ST011. Sampling results from the Basewide RI indicated that three (3) VOCs - TCE, cis-1,2-DCE, and vinyl chloride - were detected in five (5) monitoring wells at concentrations above the corresponding RACGs. The five (5) wells were pair wells MW-001(S)/MW-008(D), MW-003(S)/MW-007(D), and one (1) deep well MW-006(D). The two (2) well pairs are located between Buildings 620 and 617, in the vicinity of the former Building 620 UST location. MW-006 is located several feet from the northernmost corner of Building 620. The VOCs were detected in both shallow and deep wells, suggesting a vertical hydraulic connection between shallow and deep zones. The contamination extends northwest of Building 620. The estimated area of contaminated groundwater is 0.11 acre.

Groundwater flows southeast through both silty clay/weathered shale transition zone and limestone at the site at an estimated hydraulic gradient of 0.014 ft/ft. Based on aquifer tests conducted in July 2000, flow velocities in the silty clay ranged from 0.0044 ft/day to 0.014 ft/day. In contrast, groundwater velocity was estimated at 0.42 ft/day in the limestone, a result likely reflecting the local fracture-flow conditions.

Because of the elevated VOC concentrations in groundwater, the site has been included in the QGM program since June 2000 (CH2M HILL, 2000-2003). Because of the relatively low groundwater flow velocities at the site, the potential for future down gradient transport of contaminants is low based on QGM results. Figure 2-11 presents the October 2003 QGM analytical results.

2.5.8 Fate and Transport of Contaminants

For OU-1, residual concentrations of petroleum hydrocarbons in soil are expected to diminish with time as a result of various environmental degradation processes that occur naturally with organic chemicals such as petroleum compounds. Importantly, no sources of hydrocarbon contamination remain following the successful completion of IRAs that excavated the majority of contaminated soil from each OU-1 site (CH2M HILL, 2003b).

For OU-2 sites, the extent of groundwater contamination is limited because of the low hydraulic conductivities and groundwater flow rates that predominate in the clay, shale, and limestone formations underlying sites at the Base. Contaminant migration is further limited because there are no known contaminant sources remaining. This conclusion is supported by the consistent QGM data, which indicate that the concentrations and distribution of VOCs in groundwater appears to be stable with the exception of increasing TCE concentrations in a single well (MW-020) at SS006 (see Section 2.5.7.2 above), which appears to be an anomaly in light of other groundwater monitoring results. Generally, the area of contaminated groundwater at each site has remained unchanged over the past two (2) years and, absent available, continuing sources, would be expected to shrink over time as a

result of various degradation processes that occur naturally with organic chemicals, although it may be decades before RACGs are finally reached.

2.5.9 Conceptual Site Model

The conceptual model of exposure pathways was developed to depict the potential relationship or exposure pathway between chemical sources and human receptors prior to the interim remedial actions taken. An exposure pathway describes a specific environmental pathway by which a receptor can be exposed to the chemicals in environmental media.

The conceptual model of potential exposure pathways for sites at the Base was first presented in the Basewide RI. The model has been updated to focus upon the soil and groundwater exposure pathways remaining for OU-1 and OU-2. These pathways are described in the following paragraphs. For further details, please refer to the Basewide RI Report (CH2M HILL, 2001 a).

2.5.9.1 Potential Receptors

The potential for exposure is greatly influenced by the land use of the site. The anticipated reuse at the former Richards-Gebaur AFB is commercial and light industrial. The primary purpose of the response action is to prevent residential direct exposure to soils contaminated with TPH above unrestricted use levels (RACG) of 200 ppm, and to prevent human exposure to contaminated groundwater until the respective RACGs have been achieved. Residential reuse is not currently planned or anticipated. LUCs are proposed to implement the restrictions and prohibitions described briefly here and in more detail in Section 2.14.

2.5.9.2 Potential Exposure Pathways Associated with OU-1 (Soil)

Following completion of the IRAs, three (3) sample locations remained at FT002 where residual hydrocarbon concentrations exceeded the RACG for TPH of 200 ppm for unrestricted use, and one (1) sample location (at a depth of 18 feet) remained where the residual TPH concentration also exceeded the commercial-light industrial RACG of 500 ppm. Similarly, at ST005, 26 sample locations remained where residual TPH concentrations exceeded the CALM-based RACG for unrestricted land use of 200 ppm.

Because TPH values represent a group of compounds, a quantitative risk assessment for the residual TPH could not be performed. Consequently, the BCT agreed to evaluate TPH concentrations in comparison to applicable MDNR CALM soil target concentrations for TPH. The CALM values thus became default RACGs for TPH. The evaluation showed that residual concentrations of TPH compounds in soils at both FT002 and ST005 exceeded MDNR's unrestricted land use criterion for TPH of 200 ppm.

Although the CALM criteria for TPH were not quantitatively derived, the CALM criterion for TPH of 200 ppm is assumed to be protective of human health and the environment under an unrestricted land use scenario. Because this unrestricted land use criterion for TPH is exceeded in soils at FT002 and ST005, potential future residents may be exposed to levels above the TPH RACG under an unrestricted reuse scenario. Proposed LUCs address this potential risk by prohibiting excavation of the contaminated soils, and prohibiting residential property use, until RACGs are achieved.

2.5.9.3 Potential Exposure Pathways Associated with OU-2 (Groundwater)

There are six (6) OI1-2 sites that are part of this ROD: SS003, SS006, SS009, SS012, ST005, and ST011 (see Table 1 above). Groundwater beneath the six (6) OU-2 sites is contaminated with VOCs, including TCE, cis-1,2-DCE, and vinyl chloride. It is likely that groundwater contamination originates from the past storage or handling of solvents that were routinely used to clean oily machine parts when the Base was operational. To help monitor the contamination, a QGM program was established for the six (6) sites in question. The following exposure scenarios were evaluated:

Future Residents - Available information indicates that groundwater under the sites is unlikely to be used as a drinking water supply. Well surveys indicate that the shallow groundwater under and in the vicinity of the former Richards-Gebaur AFB is not used for domestic purposes. Furthermore, the Base and nearby communities obtain their domestic water supply from the Kansas City Water and Pollution Control Department. Therefore, it is most unlikely that complete exposure pathways could exist for the hypothetical consumption of groundwater by future residents.

However, future residents may be exposed to indoor air that has become contaminated as a result of VOCs volatilizing from the underlying contaminated groundwater. For this pathway to be considered complete, it is assumed that volatile constituents (principally chlorinated VOCs) in groundwater could partition into soil gas and become transported through soil gas. into overlying structures. These constituents could then mix with indoor air, potentially resulting in inhalation exposure by individuals inside the structure. However, risks to future residents or workers from exposure to indoor air that is potentially contaminated as a result of VOC volatilization from groundwater were well below applicable regulatory risk ranges.

Future Workers - Workers in buildings that are located over groundwater contaminated with VOCs could potentially be exposed through migration of VOCs from groundwater to indoor air, followed by inhalation exposure. For this pathway to be considered complete, it is assumed that volatile constituents (principally chlorinated VOCs) in groundwater could partition into soil gas and become transported through soil gas into overlying structures. These constituents could then mix with indoor air, potentially resulting in inhalation exposure by individuals inside the structure. Risks to workers from this potential exposure pathway were well below applicable regulatory risk ranges.

Construction Workers - Construction workers may excavate soils for utility installation, maintenance or other purposes. Shallow groundwater may seep into the excavation. Volatile organic compounds could volatilize directly from groundwater during excavation. Construction workers also could experience direct skin contact with groundwater, under these conditions. Therefore, it is assumed that, for construction workers, potentially complete exposure routes for groundwater are dermal contact and inhalation of VOCs.

Trespassers - Trespassers are unlikely to have contact with groundwater at the site. Thus, it is assumed there are no complete exposure pathways from groundwater to trespassers.

For these potential exposure scenarios, either the risk assessment concluded that no complete exposure pathway existed, or the potential exposure pathway is being addressed through remedies selected in this ROD (see Section 2.14).

2.6 Current and Potential Future Land and Resource Uses

2.6.1 Land Uses

The USAF currently owns roughly 233 acres of the former 2,400-acre installation. That property includes former aircraft hangars, equipment and grounds maintenance shops, materials storage facilities, communication facilities, and administrative support buildings. The USAF also retains ownership of five (5) areas that are not contiguous with the main installation: the fire training area, the air traffic transceiver facility, the small arms firing range, the survival equipment shop, and the nondestructive inspection laboratory. The majority of the former installation (1,673 acres) was transferred to the General Services Administration in 1980, with 1,360 acres being allocated to the City of Kansas City and 313 acres being allocated to the City of Belton.

The USAF property is leased to the USMC and the Kansas City Aviation Department. Until January 2000, the city-leased property was used to support aviation activities at the civilian airport. However, in November 1999, Kansas City passed a referendum to allow use of the airfield as an intermodal transportation facility. As a result, the Kansas City Aviation Department officially deactivated the runway in January 2000. All aircraft operations have ceased, and the airfield is used to stage and load new automobiles onto trucks and railcars for distribution. Most of the buildings are vacant and have not been used since the closure of the airfield. The USMC-leased property is used for USMC support activities. None of the Air Force owned property is used for residential purposes.

The nearest residential populations are military personnel located on the AFB in the Billeting Complex, about a half-mile southeast of the Base. Non-military residential populations exist about one (1) mile south of Base. The towns closest to the site include Belton, with a population of 21,900, and Grandview, with a population of 25,000 (CCI, 2001).

The future land use at the former Richards-Gebaur AFB is intended to be commercial and light industrial, consistent with the Local Reuse Authority's plan for most of the remaining Air Force property, including the OU-1 and OU-2 sites. The City of Kansas City KCPDD is the local reuse authority and will receive most of the former Base property from the Air Force as part of approved Economic Development Conveyance. Sites SS003 and SS009, however, are not part of the land being redeveloped by KCPDD and will be transferred to the Navy for continued USMC support activities.

2.6.2 Surface Water Resources

The former Richards-Gebaur AFB (with the exception of the Belton Training Complex, four (4) miles south of the main Base) is located primarily within the Missouri River drainage basin. The surface hydrology is dominated by the drainage systems of the Blue and Little Blue rivers.

At the Base, surface runoff usually drains south and east in several small, unnamed streams. Most of these small streams flow down gradient toward Scope Creek while a few do not reach Scope Creek. Scope Creek is an intermittent stream that carries water most of the time. It flows diagonally from southwest to northeast, past the Small Arms Firing Range and offsite south of the intersection of State Highway 150 and US Route 71, terminating in the Little Blue River.

A number of small streams in and around the Base have been dammed, creating several man-made ponds. Currently, only one pond exists at the base. The pond lies several hundred feet east of site SS012, the former Communications Facility at Building 105.

The Missouri River is the drinking water source for the entire region. Drinking water is supplied to the Base and surrounding communities by the Kansas City Water and Pollution Control Department.

2.6.3 Groundwater Resources

Groundwater within and surrounding the former Richards-Gebaur AFB is of marginal quality and produces low yields. TDS in groundwater ranged from 330 ppm to 7,000 ppm, because of high concentrations of sodium and chloride (MDNR, 1997). The recommended USEPA Secondary Maximum Contaminant Level (MCL) for TDS is 500 ppm. Consequently, it is not used locally for domestic purposes (MDNR, 1997). Relatively impermeable limestones and shales of the Kansas City Group dominate the underlying geology at the Base. The yield from shallow wells located within these formations is very low, generally less than five (5) gpm, and, because of the chemical composition of the rock, tends to become increasingly saline with depth.

Groundwater occurs sporadically across the Base, typically in the transition zone between the unconsolidated surficial materials that cover the uplands and slopes and the underlying weathered bedrock. In upland areas, groundwater may be found trapped within clay-filled openings in weathered limestone that occur near the ground surface.

Based on local monitoring well data, groundwater elevations can vary considerably over short distances, and groundwater often is absent. Where present, the depth to groundwater generally is shallow, varying from less than 10 feet to about 30 feet below ground surface. Generally, higher water elevations are observed in the spring and fall, although water levels in most wells remain fairly constant throughout the year. A more detailed account of groundwater levels is provided in Section 3 of the FS report (CH2M HILL, 2002b).

During the Basewide RI and QGM events, many of the wells were found to be slow to recharge, and several wells were found to be dry. Because of the lack of productive, potable groundwater resources, the Base and surrounding municipalities of Kansas City, Belton, and Grandview do not use groundwater for domestic purposes, but use water supplied from the Missouri River by the Kansas City Water and Pollution Control Department.

2.7 Summary of Human Health Risks

The human health risk assessments for OU-1 and OU-2 sites were conducted as part of the RI following USEPA *Risk Assessment Guidance for Superfund (RAGS)* (USEPA, 1989) and *Air Force Center for Environmental Excellence (AFCEE) Guidance for Risk Assessment* (AFCEE, 1997). The risk assessment also incorporates a tiered approach based on the *American Society for Testing and Materials (ASTM) Risk-Based Corrective Action (RBCA) Guidance* (ASTM, 1998).

The approach for potential exposure to soil contaminated with TPH compounds was not risk-based because TPH compounds represent a chemical group that cannot be quantitatively evaluated through risk assessment. Consequently, the BCT agreed to evaluate TPH concentrations in comparison to applicable MDNR CALM soil target concentrations for TPH. The CALM values thus became default RACGs for TPH. The evaluation showed that residual concentrations of TPH compounds in soils at both FT002 and ST005 exceeded MDNR's unrestricted land use criterion for TPH of 200 ppm.

Although the CALM criteria for TPH were not quantitatively derived, the CALM criterion for TPH of 200 ppm is assumed to be protective of human health and the environment under an unrestricted land use scenario.

At OU-1 sites, following the completion of IRAs at FT002 and ST005, the risks remaining at the sites are wholly associated with residual concentrations of petroleum hydrocarbons as expressed by TPH values. Accordingly, the need for remedial action at OU-1 is not based on formal risk assessment but is primarily predicated on whether a given TPH concentration exceeds MDNR's unrestricted land use criterion for TPH of 200 ppm. Because this unrestricted land use criterion for TPH is exceeded in soils at FT002 and ST005, the BCT agreed to prohibit potential residential reuse of these sites until RACGs have been achieved. Similarly, sampling results at one (1) location at FT002 and eight (8) locations at ST005 exceeded the CALM commercial-light industrial criteria of 500 ppm, justifying a prohibition on excavation of these contaminated soil locations. For administrative convenience and to provide clear notice to grantees, the Air Force has chosen to implement an overall restriction on excavating identified contaminated soils above CALM levels at these two (2) sites.

For OU-2 sites, there is no need to evaluate residential use of groundwater because such use is highly unlikely. However, to preclude even the potential for such direct use, LUCs will prohibit either direct groundwater extraction/use or residential property use until RACGs are achieved.

2.7.1 OU-1 (Soils)

Risks at OU-1 sites FT002 and ST005 are associated with several former soil sample locations that had TPH concentrations above MDNR's unrestricted land use criterion for TPH of 200 ppm. In other words, the risks are associated with potential direct contact exposure to residual sample locations that, for practical reasons (e.g., adjacent utility lines or building foundations), could not be excavated during implementation of the IRAs.

Following completion of the IRAs, three (3) sample locations remained at FT002 where residual hydrocarbon concentrations exceeded the RACG for TPH of 200 ppm, and one (1) sample location (at a depth of 18 feet) remained where the residual TPH concentration also exceeded the commercial-light industrial RACG of 500 ppm. At FT002, two (2) of the sample locations with concentrations greater than MDNR's unrestricted land use criterion for TPH of 200 ppm are within three (3) feet of the ground surface.

Similarly, at ST005, 26 sample locations remained where residual TPH concentrations exceeded the CALM-based RACG for unrestricted land use of 200 ppm. Six (6) of the sample locations with TPH concentrations above 200 ppm are within three (3) feet of the ground surface. (Although the residual contamination at FT002 was originally deeper than three (3) feet, extensive re-grading of the site after the IRA has reduced the amount of soil cover bringing these sample locations within three (3) feet of ground surface).

2.7.2 OU-2 (Groundwater)

For the OU-2 sites, risk assessment results indicated that an excess lifetime cancer risk of between 3×10^{-3} and 4×10^{-5} was associated with potential consumption of contaminated groundwater, exceeding the applicable risk thresholds of 1×10^{-5} for an excess lifetime cancer risk. Risks to future residents or workers from exposure to indoor air that is potentially contaminated as a result of VOC volatilization from groundwater were well below applicable

regulatory risk ranges. Thus, to mitigate potential risks posed by contaminated groundwater, it is necessary to prevent potential direct use of groundwater at the OU-2 sites.

2.8 Summary of Ecological Risks

Ecological risk assessment is part of the three-tiered CALM process, wherein the cleanup levels indicated by any of the three (3) tiers are intended to provide an equal level of protection for human health and the environment. Evaluation of ecological risk using the CALM process begins in Tier 1 with a qualitative ecological exposure assessment for all sites. If it is determined during the qualitative assessment that ecological receptors could be significantly exposed to site contaminants, then a quantitative assessment, conducted in coordination with MDNR, might be required under Tier 2 or Tier 3 of the CALM process.

The ecological risk evaluation is concluded, and there is no need to proceed to an exposure pathway analysis (Phase II), in cases where few or no ecological receptors are present on or adjacent to the site, providing the absence or reduction of receptors cannot be attributed to a release of contaminants. When potential ecological receptors or habitat were found to be present at a given site, the site proceeded to a Phase II evaluation. Phase II was used to determine whether any receptors or habitat present at or adjacent to a site were at potential risk from contact with a contaminant release on or near the site in question.

A screening-level ecological risk assessment was performed for each of OU sites with residual contamination. The assessment involved visiting each site and identifying the main species of plants present and animals using each site. An assessment was then made as to whether these receptors could actually come into contact with the contaminants remaining in soil or groundwater. The results indicated that no significant risks to ecological receptors were present as a result of potential exposures to residual soil and groundwater contamination.

2.8.1 OU-1 (Soils)

For the two (2) OU-1 sites, no sensitive ecological habitats and no affected receptors were found during the Phase I exposure pathway analyses. Because of the depth of the residual contamination, the potential for ecological exposures to the contaminated soil is considered to be minimal.

2.8.2 OU-2 (Groundwater)

For five (5) of the six (6) OU-2 sites no ecological habitats and no receptors were found during the Phase I exposure pathway analyses. However, at OU-2 site SS012, several potential receptors were identified, and it was necessary to complete a Phase II ecological evaluation. This evaluation included an assessment of the types of habitats on or near the site, and an assessment of the presence of receptors and migration pathways for site contaminants to potentially reach media where ecological receptors could be potentially exposed (e.g., surface water bodies or contaminated surface soils).

Based on the Phase II evaluation, a quantitative evaluation of potential VOC exposures to burrowing animals was conducted. The results indicated that unacceptable risks to burrowing animals were not present at the site.

2.9 Basis for Action

The response actions selected in this ROD for OU-1 and for OU-2 are necessary to protect the public health or the environment from actual or threatened releases of pollutants or contaminants from these sites that may present a substantial endangerment to public health or the environment.

For OU-1, the initial, interim remedial component was excavation and removal of the contaminated soils. The subsequent imposition of LUCs at the two (2) remaining OU-1 sites represents the final remedy and are required because residual concentrations of TPH compounds in soils at both FT002 and ST005 exceeded MDNR's unrestricted land use criterion for TPH of 200 ppm. Risks to future residents or workers from exposure to indoor air that is potentially contaminated as a result of VOC volatilization from groundwater were well below applicable regulatory risk ranges.

For OU-2, the implementation of LUCs, supported by LTM, represents the final remedy for the six (6) sites with groundwater contamination. The LUCs will prevent potential risks posed by the contaminated groundwater by prohibiting extraction and any use of the contaminated groundwater at each of the six (6) OU-2 sites.

2.10 Remedial Action Objectives

Remedial Action Objectives (RAO) provide general descriptions of what the selected remedy will accomplish and form the basis for the selection of remedial alternatives for OU-1 and OU-2 sites. RAOs for OU-1 sites were first presented in the FFS (CH2M HILL, 2002a). RAOs for OU-2 were established in the FS (CH2M HILL, 2002b). A summary of the applicable RAOs for soil and groundwater is provided below.

2.10.1 OU-1 (Soils)

For OU-1 sites, the remedial action objective is:

- To remove the potential for residential exposure to soils containing petroleum hydrocarbons at concentrations exceeding MDNR's unrestricted land use criterion for TPH of 200 ppm and to remove the potential for worker exposure above the MDNR commercial-light industrial criteria for TPH of 500 ppm

2.10.2 OU-2 (Groundwater)

For the OU-2, the remedial action objective is:

- To prevent human exposure to contaminated groundwater with contaminant concentrations that pose risks greater than 1×10^{-4} to 1×10^{-6} (carcinogens) or a hazard index of 1 (noncarcinogens) for the reasonable maximum exposure scenario

2.10.3 Remedial Action Cleanup Goals for OU-1 and OU-2

Consistent with the above remedial action objectives, chemical-specific RACGs were developed as part of the RI/FS process.

For OU-1 (Soils), RACGs were derived from MDOH "Any-use Soil Levels" and MDNR's CALM guidance and Underground Storage Tank Closure Guidance Document. For OU-2

(Groundwater), RACGs were derived from published MCLs promulgated under the federal Clean Water Act.

Table .2 lists the applicable RACGs for OU-4 and OU-2 sites.

Table 2—Soil and Groundwater Remediation Action Cleanup Goals

Chemical	OU-1 (Soils)	OU-2 (Groundwater)
TPH	200 ppm	Not applicable
PCE	Not applicable	5 ppb
TCE	Not applicable	5 ppb
Cis-1,2-DCE	Not applicable	70 ppb
1,1-DCE	Not applicable	7 ppb
Vinyl chloride	Not applicable	2 ppb

2.11 Description of Alternatives

The remedial alternatives for OU-1 are derived from the FFS Report (CH2M HILL, 2002a).
The remedial alternatives for OU-2 are taken from the FS Report (CH2M HILL, 2002b).

Table 3 summaries the remedial alternatives that were evaluated for the two (2) OU-1 and six (6) OU-2 sites.

Table 3—Summary of Remedial Alternatives for OU-1 and OU-2

Medium	Designation	Alternatives
OU-1 (Soil)	S1	No Further Action
	S2	LUCs
	S3	Excavation and Landfill Disposal
OU-2 (Groundwater)	G1	No Further Action
	G2	LUCs (supported by LTM)
	G3	LUCs and Accelerated Natural Attenuation (supported by LTM)

As required by the NCP, the No Further Action alternative was retained to provide a basis for comparison of other remedial approaches. Each alternative summary presents estimates of capital costs; present worth O&M costs; and present worth costs based on a 30-year performance and construction period.

2.11.1 OU-1 (Soils)

Alternative S1- No Further Action

Capital Cost: $0

Present Worth O&M Cost: $0

Total Present Worth: $0

Under Alternative S1, no action would be taken to prevent potential exposure to the residual chemicals in soil. In other words, nothing will be done at the Base to change the current contaminated soil conditions. For example, residential reuse would be allowed, and no controls would be imposed to mitigate potential exposure to contaminated soil. Accordingly, no costs are associated with this alternative.

Alternative S2 - LUCs

Capital Cost: $0

Present Worth O&M Cost: $89,000

Total Present Worth: $89,000

Alternative S2 involves implementation of LUCs to restrict or control access to the residually contaminated locations within the property. LUCs will be used to minimize the potential risk of unacceptable exposure to contaminated soil at the former Richards-Gebaur AFB by restricting property use to commercial or light industrial and by prohibiting unauthorized excavation in areas where TPH concentrations are above the CALM-based RACG for unrestricted land use of 200 ppm. The primary LUC will be restrictive covenants within the property Deed.

The Air Force will implement, monitor, and enforce the LUCs to ensure full-time compliance and continued protection of human health and the environment. In addition, Five-Year Reviews of each site will be conducted in accordance with Section 121c of CERCLA. The LUCs will be removed when soil-sampling results indicate that concentrations of petroleum hydrocarbons are at or below the unrestricted land use criterion for TPH of 200 ppm. Because of the periodic monitoring and reporting required, this alternative has good long-term reliability. It is estimated that RACGs can be achieved in five (5) years to 10 years.

Alternative S3 - Excavation and Landfill Disposal

Capital Cost: $522,000

Present Worth O&M Cost: $0

Total Present Worth: $522,000

Alternative S3 entails excavating and removing the hydrocarbon-contaminated soils remaining at the two (2) sites. To do so, it would be necessary to remove the clean backfill that has been placed over the excavations from the former interim remedial action at both sites. This involves soil excavation of 1,170 cubic yards at FT002 and 4,750 cubic yards at ST005. Of these volumes, 150 cubic yards of contaminated soil from FT002 and 3,200 cubic yards from ST005 would be excavated, transported, and disposed of offsite at a

permitted landfill. Following soil removal and confirmation sampling, the open excavations at FT002 and ST005 would be backfilled and the site re-graded and restored once again. This alternative has good long-term reliability because the contamination is removed from the site. It is estimated that RACGs can be achieved within one (1) year.

2.11.2 OU-2 (Groundwater)

Alternative G1- No Further Action

Capital Cost: $0

Present Worth O& M Cost: $0

Total Present Worth: $0

Under Alternative 1, no action would be taken to prevent potential exposure to the residual chemicals in groundwater. Accordingly, no costs are associated with this alternative.

Alternative G2 - LUCs (supported by LTM)

Capital Cost: $0

Present Worth O&M Cost: $648,000

Total Present Worth: $648,000

Alternative G2 consists of establishing a series of LUCs to restrict property use and prevent potential exposure to contaminated groundwater. The United States will implement, monitor, and enforce the LUCs. The LUCs would prevent extraction and use of underlying groundwater by imposing restrictive covenants within the property Deed that would prohibit the extraction and use of groundwater. LTM will support the LUCs and allow systematic, periodic evaluation of site groundwater quality to help ensure that the established LUC boundaries fully encompass the contaminant plumes or else provide notice for future additional actions should consecutive LTM results indicate that contaminant migration is occurring. In the event that plume migration is found to be occurring, additional monitoring wells will be installed at the site in question to redefine the lateral extent of contamination. If necessary, the LUC boundaries will be reassessed and expanded to ensure that the groundwater contamination remains encompassed by the LUC area. In addition, to continue to protect human health and the environment, the frequency of monitoring may be adjusted based on site-specific risk considerations.

The United States will consult with MDNR and USEPA regarding the basic features of the LTM program. For each site, the Air Force will identify the monitoring wells that constitute the LTM network, and will establish the necessary analytical methods and frequency of monitoring based on assessed risk and the remedial action objectives identified in the ROD. The LTM results will be used to support termination of LUCs when the data indicate that RACGs have been met for two (2) consecutive sampling events occurring at least three (3) months apart but no longer than one (1) year apart. Because of the periodic monitoring and reporting required, this alternative has good long-term reliability. It is anticipated that RACGs can be achieved within 100 years.

Alternative G3 - LUCs and Accelerated Natural Attenuation (supported by LTM)

Capital Cost: $5,121,000

Present Worth O&M Cost: $1,750,000

Total Present Worth: $6,871,000

Alternative G3 combines LUCs, groundwater amendment, and LTM. LUCs would prevent the extraction and use of groundwater at OU-2 sites. The Air Force will implement, monitor, and enforce the LUCs. Adding a chemical catalyst to the contaminated groundwater zone to promote biodegradation of VOCs, if present and active, would accelerate natural attenuation processes. A LTM program would use the existing networks of monitoring wells at the six (6) sites to evaluate the progress of contaminant destruction through accelerated natural attenuation. Because of the periodic monitoring and reporting required, this alternative has good long-term reliability. It is estimated that RACGs could be achieved within 30 years.

2.12 Comparative Analysis of Alternatives

The USEPA has established nine (9) criteria to use in evaluating remedial alternatives individually and comparatively to help select a preferred alternative. These criteria are classified as threshold criteria, balancing criteria, and modifying criteria.

Threshold criteria are standards that must be met by an alternative for it to be eligible for selection as a remedial action. There is little flexibility in meeting the threshold criteria — the alternative must meet them or it is unacceptable. Threshold criteria are:

- Overall protection of human health and the environment
- Compliance with Applicable Relevant and Appropriate Requirements (ARARs)

Balancing criteria weigh the tradeoffs between alternatives. These criteria represent the standards upon which the detailed evaluation and comparative analysis of alternatives are based. In general, a high rating on one can offset a low rating on another balancing criterion. Five (5) of the nine (9) criteria belong to balancing criteria:

- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume through treatment
- Short-term effectiveness
- Implementability;
- Cost

Modifying criteria are*:*

- Community acceptance
- State/support agency acceptance

This section summarizes how well each alternative satisfies each evaluation criterion and indicates how it compares to the other alternatives under consideration. The information is presented in greater detail in the OU-1 FFS and OU-2 FS reports.

2.12.1 OU-1 (Soils)

2.12.1.1 Overall Protection of Human Health and the Environment

Alternative S1 is not protective of human health and the environment because it would not prevent future excavation by workers or residents and subsequent exposure to residual hydrocarbon-contaminated soil.

Alternative S2 is considered protective because it would prevent unauthorized access to the areas of residually contaminated soil and would prohibit excavation of such areas. Other reinforcing mechanisms (e.g., monitoring and inspection of the sites, initial and reinforcing notifications to property grantees) afford additional layers of security to protect future populations from exposure to the isolated areas of contaminated soil that remain at FT002 and ST005 with residual TPH concentrations above the CALM-based RACG for unrestricted land use of 200 ppm. For both sites, residential land use will be prohibited, but commercial and light industrial land use is permissible.

Alternative S3 is also protective because the residually contaminated soil would be excavated, removed from the sites, and disposed of as special waste at a permitted landfill or, if necessary, treated and disposed of at a permitted hazardous waste landfill.

2.12.1.2 Compliance with ARARs

Alternative S1 does not comply with chemical-specific ARARs. There are no location- specific ARARs or action-specific ARARs applicable for this alternative at the two (2) sites. However, it should be noted that chemical-specific ARARs for industrial land use have been achieved through implementation of the IRAs at the six (6) OU-1 sites.

Alternative S2 will meet chemical-specific ARARs after a period of natural degradation. Petroleum hydrocarbons are organic compounds that degrade over time and TPH concentrations are expected to slowly diminish, eventually to levels below the current 200-ppm TPH threshold for unrestricted land use. There are no location-specific or action-specific ARARs for Alternative S2.

Alternative S3 would likely achieve chemical-specific ARARs, providing that post-excavation sampling successfully demonstrates that residual TPH concentrations are below the CALM- based RACG for unrestricted land use of 200 ppm. During excavation and disposal of the petroleum contaminated soil, standard construction mitigation measures (e.g., silt fences) would be implemented to ensure compliance with action-specific ARARs. Storm water and dust control measures would be taken to ensure compliance with location-specific ARARs regulating activities near surface water bodies and wetlands. Potentially contaminated runoff would be prevented from entering surface water bodies. A site-specific Health and Safety Plan would be implemented to ensure compliance with Occupational Safety and Health Standards during construction, monitoring, and maintenance activities.

2.12.1.3 Long-Term Effectiveness and Permanence

Alternative S1 does not provide long-term effectiveness and permanence. The risk associated with residually contaminated soil would not be reduced.

Alternative S2 will satisfy this criterion by providing enforceable property controls and establishing regular periodic monitoring and inspection of the LUCs over time.

Alternative S3 would satisfy the criterion of long-term effectiveness and permanence by removing the contaminated soil and disposing of it an offsite landfill.

2.12.1.4 Reduction of Toxicity, Mobility, and Volume

Alternative S1 would not provide any reduction of toxicity, mobility, and volume of the petroleum contamination and does not meet the statutory preference for treatment.

Alternative S2 does not provide any reduction of toxicity, mobility, and volume of the petroleum contamination and does not meet the statutory preference for treatment.

Under Alternative S3, contaminant toxicity, mobility, and volume could be significantly reduced and eliminated, although it does not meet the statutory preference for treatment.

2.12.1.5 Short-Term Effectiveness

Alternative S1 does not include any onsite construction and as a result has no short-term construction-related impacts.

Alternative S2 also does not include any onsite construction and as a result has no short- term construction-related impacts. The time until remedial objectives are met is minimal because implementation of LUCs at the two (2) sites with residual soil contamination would immediately preclude potential human exposures to the contaminated soil.

Alternative S3 has minimal impacts during construction. The relatively low TPH concentrations of the contaminated soils would pose little risk to construction workers, the community, or the environment during excavation, transport and disposal. The time until remedial objectives are met is less than one (1) month because of the small volumes of contaminated soil (assuming that post-excavation sampling results do not exceed 200 ppm for TPH).

2.12.1.6 Implementability

Alternative S1 has nothing to implement.

Alternative S2 is easily implemented once the necessary authorities have been alerted and the proposed LUCs identified. Because of the broad-based acceptance of LUCs as a risk management tool and the impending transfer of USAF property to the municipality of Kansas City, little difficulty is expected in selecting and administering the necessary LUCs at the Base.

Alternative S3 can be implemented with little difficulty because the excavation and landfill disposal is widely used and well understood. However, delays could occur because of inclement weather or equipment breakdowns.

2.12.1.7 Cost

Alternative S1 will not incur any costs.

Alternative S2 is projected to cost $89,000, more than Alternative S1 but less than Alternative S3. It would cost approximately $44,500 for each of the two (2) sites.

Alternative S3 is projected to cost $522,000 and is the most expensive of the three (3) remedial alternatives. With this alternative, it would cost $63,000 for FT002 and $459,000 for ST005, respectively. The additional cost estimated for excavation of FT002 is relatively minimal, compared to LUCs alone. However, based on knowledge gained during historical excavations performed at FT002, and the depth of contamination (18 feet), there is a significant risk of cost-growth during excavation.

2.12.1.8 State Acceptance

MDNR in conjunction with USEPA has provided input during the preparation of the Proposed Plan and ROD and their concurrence with the selected remedy is presented in Appendix A. It is believed that the selected remedial alternatives for OU-1 are protective of human health and the environment, comply with ARARs, are cost-effective, and can be readily implemented in a timely fashion.

2.12.1.9 Community Acceptance

This criterion addresses public comments received on the Administrative Record and the Proposed Plan. Community comments to the selected remedy were evaluated following the public comment period and are discussed in Section 3 - Responsiveness Summary.

2.12.2 OU-2 (Groundwater)

2.12.2.1 Overall Protection of Human Health and the Environment

Alternative G1 is not considered protective because it does not provide LUCs to prevent access to contaminated groundwater. The alternative would not protect human health and the environment because the risk posed from contaminated groundwater would not be reduced or mitigated. Future exposure to onsite groundwater would be expected to result in unacceptable risks.

Alternatives G2 and G3 are considered protective because they impose restrictive covenants on the property Deed to prevent groundwater extraction and use and, therefore, mitigate potential exposure to unacceptable concentrations of residual VOCs. Also, the implementation of LTM would ensure that LUC boundaries encompass contaminant plumes or else indicate the need for possible additional actions should consecutive LTM results indicate that contaminant migration is occurring or soon will occur outside of the identified LUC boundaries. In the event that plume migration is found to be occurring, additional wells will be installed at the site in question to redefine the lateral extent of contamination. If necessary, the LUC boundaries will be reassessed and expanded to ensure that the groundwater contamination remains encompassed by the LUC area. In addition, to continue to protect human health and the environment, the frequency of monitoring may be adjusted based on site-specific risk considerations.

2.12.2.2 Compliance with ARARs

Alternative G1 does not comply with chemical-specific ARARs. There are no location- or action-specific ARARs applicable to Alternative 1.

Alternatives G2 and G3 would be expected to comply with applicable ARARs. However, it is expected that the accelerated natural attenuation alternative (G3) would meet chemical- specific ARARs in less time than alternative G2, possibly within five (5) to 10 years.

2.12.2.3 Long-Term Effectiveness and Permanence

Alternative G1 does not provide long-term effectiveness and permanence. The risk associated with the groundwater would not be reduced and might be increased should further migration of contaminants occur.

For Alternative G2, although the magnitude of residual risks will not be reduced in the short term, institutional controls would provide adequate and reliable risk management by

prohibiting potential groundwater use, thereby mitigating potential exposures and consequent risk.

The long-term reliability and permanence of Alternative G3 is better than those for the other remedial alternatives because the technology actively reduces contaminant mass and breaks down contaminants into nonhazardous products, thereby more quickly reducing the magnitude of residual risk over time. However, the effectiveness of substrate addition in low permeability aquifers has not been good because of the difficulty in achieving good distribution throughout the contaminated zone.

Based on the sites' geology and hydrogeology, the main drawbacks to using this alternative appear to be the small amount of hydrogen released compounds (HRC) that can be placed in the subsurface and the slow rate of material dispersal and mixing with the local groundwater. The most likely outcome is incomplete destruction that would still require LTM until RACGs are met. In addition, the strongly reducing environment created by HRC injection will mobilize naturally occurring iron and manganese. If the treated groundwater is near a surface water discharge location such as Scope Creek, the mobilized iron would precipitate, potentially raising aesthetic concerns along the creek bank.

2.12.2.4 Reduction of Toxicity, Mobility, and Volume

Alternative G1 would not provide any reduction of toxicity, mobility, and volume and does not meet the statutory preference for treatment.

Alternative G2 is incapable on its own of reducing the toxicity, mobility, and volume of the residual VOCs in groundwater because it does not involve active treatment (natural attenuation is not considered treatment in the context of this evaluation criterion).

Alternative G3, however, would provide a more timely reduction in the toxicity, mobility, and volume of contaminants under suitable geochemical conditions.

2.12.2.5 Short-Term Effectiveness

This criterion addresses short-term impacts of the remedial alternatives by examining the effectiveness of alternatives in protecting human health and the environment. This evaluation criterion addresses the effects of the alternative during the construction and implementation phase until remedial action objectives are met.

Because active remediation of groundwater would not be undertaken under Alternatives G1 and G2, the potential risks to human health and the environment as a result of implementing them would be negligible. In other words, they would pose no increased risk to the surrounding community in the short term.

Alternative G3 could present additional risks to workers or other surrounding populations during remedial construction. However, those risks can be controlled or mitigated providing standard health and safety protocols are established and followed during execution of the remedial alternative.

2.12.2.6 Implementability

Alternative G1 does not have a monitoring or construction component associated with it, so it is easily implemented.

Implementation of Alternative G2 would be routine because a comprehensive groundwater-monitoring network exists at the Base and has been in use for more than 18 months.

Consequently, appropriate monitoring protocols and methodologies have been established and approved by the BCT.

The technical implementability of Alternative G3 is relatively straightforward and services and materials are readily available. However, the physical site conditions (low permeability, and low groundwater flow rates) constrain effective implementation of Alternative G3 for the reasons stated above in Section 2.12.3. Also, administratively, implementation may be more problematic than Alternatives G1 and G2 because the state of Missouri has indicated that an underground injection permit would be necessary to enact this alternative. Therefore, both technically and administratively, Alternative G3 is considered difficult to implement.

2.12.2.7 Cost

Alternative G1 would not incur any costs.

There are no additional capital costs associated with Alternative G2 because the monitoring well network is established. O&M costs would depend on the duration and extent of the monitoring program. Monitoring costs would be relatively low because the slow rate of groundwater movement allows longer intervals between sampling events—for example, annual sampling as opposed to quarterly sampling. The cost for Alternative G2 was estimated to be $0.7 million.

The capital costs of Alternative G3 are moderate to high, depending on the volume of groundwater treated. O&M costs associated with this alternative would be low and comparable to those of Alternative G2. The estimated cost for Alternative G3 was $6.9 million, significantly more expensive than Alternative G2.

2.12.2.8 State Acceptance

MDNR in conjunction with USEPA has provided input during the preparation of the Proposed Plan and ROD and their concurrence with the selected remedy is presented in Appendix A. It is believed that the selected remedial alternatives for OU-2 are protective of human health and the environment, comply with ARARs, are cost-effective, and can be readily implemented in a timely fashion.

2.12.2.9 Community Acceptance

This criterion evaluates issues and concerns the public may have regarding the alternatives. No comments were received on the selected remedy for either OU-1 or OU-2 sites.

2.13 Principal Threat Waste

The NCP expects that treatment that reduces the toxicity, mobility, or volume of the principal threat wastes will be utilized by a remedy to the extent practicable. The remaining soil and groundwater contamination will not be treated but will be reduced via natural degradation. However, no principal threat waste is present at the former Richards-Gebaur AFB.

2.14 Selected Remedy and Performance Measures

The primary indicator of remedial action performance will be satisfying the RAOs for OU-1 and OU-2, thereby ensuring continued protection of human health and the environment. Performance measures are defined herein as the remedial action objectives (see Section

2.10) plus the required actions to achieve the defined objectives as defined in this Section. It is anticipated that successful implementation, operation, maintenance, and completion of the performance measures will achieve protective and legally compliant remedies for OU-1 and OU-2 sites.

The remedy for OU-2, Alternative G2 — LUCs (supported by LTM), was selected based upon cost-effectiveness and the inability to effectively reduce VOC concentrations in groundwater because of low groundwater flow conditions produced by the shale and limestone bedrock underlying the Base. This section provides descriptions of the selected remedies and also provides specific performance measures for the selected remedies.

Remedy selections are based on the detailed evaluation of alternatives presented in the FFS (CH2M HILL, 2002) and FS (CH2M HILL, 2002) reports. It is expected that these remedies will remain in effect and be protective of human health and the environment until such time as natural biodegradation has decreased TPH (OU-1) and VOC (OU-2) concentrations to, or below, applicable RACGs.

The USAF is responsible for implementing, maintaining, and monitoring the remedial actions identified herein for the duration of the remedies selected in this ROD (until RACGs are achieved) for OU-1. The United States is responsible for implementing, maintaining, and monitoring the remedial actions identified herein for the duration of the remedies selected in this ROD (until RACGs are achieved) for OU-2. It will exercise this responsibility in accordance with CERCLA and the NCP. Approval by MDNR is required for any modification of Land Use Controls inconsistent with. the goals and objectives of this ROD.

2.14.1 OU-1 Remedy: LUCs

LUCs are the final remedial component for the two (2) OU-1 sites and address the residual petroleum hydrocarbon contamination left at FT002 and ST005 following execution of the IRAs at these sites. LUCs are the non-technical and non-engineering actions that effectively mitigate potential risks to human health and the environment by restricting access to the contaminated media at a given site.

The remedy for OU-1, Alternative S2 – LUCs, was selected to address the residual contamination based upon cost-effectiveness and the inability to completely excavate contaminated soil in areas constrained by the presence of utilities, building foundations, and other obstacles. Figures 2-4 and 2-5 indicate the areas of soil contamination requiring LUCs. LUCs will remain until soil sampling results indicate that residual TPH concentrations at all depths are at or below the CALM-based RACGs (e.g., following a five-year review). LUC boundaries will be established to encompass the areas where the TPH concentration in soil exceeds 200 ppm. A metes and bounds survey will be conducted to define the limits of the LUC boundaries. Copies of the metes and bounds survey descriptions and corresponding maps will be provided to MDNR and USEPA within 60 days of signature of the ROD.

Imposing LUCs (prohibiting residential use and prohibiting excavation of areas containing residual TPH contamination above 200 ppm) and taking the following supporting actions (which are collectively "performance measures") will accomplish the Remedial Action Objective:

(1) Placing restrictive covenants in the property Deed for each site to (a) preclude potential direct contact with (excavation of) the residually contaminated soil locations remaining at FT002 and ST005; (b) prohibit residential use; and (c) require the property recipient to obtain approval from the Air Force, MDNR, and

USEPA for any proposals for a land use change at a site inconsistent with the use restrictions and assumptions described in this. ROD. The LUCs will restrict use at FT002 and ST005 to commercial or light industrial and will prohibit excavation of identified contaminated soils. Please refer to Figures 2-4 and 2-5 for illustrations of the areas of residual contamination and the proposed LUC boundaries.

(2) Reserving rights of access to the Air Force, MDNR and USEPA, and their respective official, agents, employees, contractors, and subcontractors for purposes consistent with maintaining restrictions or taking other actions pursuant to this ROD.

(3) a. Deed Restrictions: Providing a CERCLA 120(h)(3) covenant in the property Deed at each site warranting that all remedial action necessary to protect human health and the environment with respect to hazardous substances remaining on the property has been taken before the date of the Deed; and that any additional remedial action necessary after the date of the Deed for contamination on the property existing prior to the date of the Deed will be conducted by the USAF. Deed provisions will state that the use restrictions run with the land. However, the warranty will not apply in any case in which the grantee (transferee) is a potentially responsible party. For the purposes of the warranty, the phrase "remedial action necessary" does not include additional remedial action that is required to facilitate uses and activities prohibited by the restrictive covenants established in the Deed.

b. Lease Restrictions: During the time between the adoption of this ROD and deeding of the property, equivalent restrictions are being implemented by lease terms, which are no less restrictive than the use restrictions and controls described above, in this ROD. These lease terms shall remain in place until the property is transferred by deed, at which time they will be superseded by the institutional controls described in this ROD.

(4) Conducting a metes and bounds survey of all site areas where residual soil contamination exceeds 200 ppm TPH (MDNR unrestricted land use criterion) and for which excavation is thus restricted; to be provided to the property grantee, MDNR and USEPA.

(5) Communicating in writing, as soon as practicable concurrent with the transfer of fee title, information regarding necessary environmental use restrictions and controls to the property owners and MDNR and the City of Kansas City to ensure such agencies can factor the information into their oversight and decision-making activities regarding the property.

The Deed will include provisions for the release of the restrictive covenants when RACGs have been achieved.

Section 2.14.3 below sets forth additional performance measures and actions designed to achieve the RAO for OU-1 sites, maintain the use restrictions and LUCs herein, and provide appropriate information to MDNR and USEPA on remedy status.

2.14.2 OU-2 Remedy: LUCs (Supported by LTM)

The selected remedy for OU-2 consists of imposing LUCs at each of the six (6) sites. The LUCs will be supported by LTM of groundwater conditions. The LUCs will prevent extraction

and any use of groundwater at the six (6) OU-2 sites. The LTM program will support the LUCs and allow systematic, periodic evaluation of site groundwater quality to help ensure that the established LUC boundaries fully encompass the contaminant plumes and remain protective of human health and the environment and to provide objective data to support a conclusion that LUCs can be terminated when RACGs are achieved (based on two (2) consecutive sampling events occurring at least three (3) months apart but no longer than one (1) year apart).

Imposing LUCs (prohibiting extraction or use of groundwater or activities that may interfere with or damage onsite monitoring wells) and taking the following supporting actions (which are collectively "performance measures") will accomplish the Remedial Action Objective:

(1) Placing restrictive covenants in the property Deed at SS006, SS012, ST005 and ST011 to (a) prohibit extraction or use of groundwater and (b) prohibit any land surface activities that may interfere with or damage the onsite monitoring wells. Such use restrictions will appear in transfer documents between the USAF and Navy for SS003 and SS009.

(2) Reserving rights of access to the United States (Air Force or Navy), MDNR and USEPA, and their respective official, agents, employees, contractors, and subcontractors for purposes consistent with maintaining restrictions or taking other actions pursuant to this ROD.

(3) a. Deed Restrictions: Providing a CERCLA 120(h)(3) covenant in the property Deed at SS006, SS012, ST005 and ST011 warranting that all remedial action necessary to protect human health and the environment with respect to hazardous substances remaining on the property has been taken before the date of the Deed; and that any additional remedial action necessary after the date of the Deed for contamination on the property existing prior to the date of the Deed will be conducted by the USAF. Deed provisions will state that the use restrictions run with the land. However, the warranty will not apply in any case in which the grantee (transferee) is a potentially responsible party. For the purposes of the warranty, the phrase "remedial action necessary" does not include additional remedial action that is required to facilitate uses and activities prohibited by the restrictive covenants established in the Deed.

b. Lease Restrictions: During the time between the adoption of this ROD and deeding of the property, equivalent restrictions are being implemented by lease terms, which are no less restrictive than the use restrictions and controls described above, in this ROD. These lease terms shall remain in place until the property is transferred by deed, at which time they will be superseded by the institutional controls described in this ROD.

(4) Conducting a metes and bounds survey of all areas for which groundwater extraction or use is prohibited, to be provided to the property grantee, MDNR and USEPA. The LUC boundaries as defined in the metes and bounds survey will provide a 100-foot down gradient buffer zone as a margin of safety to allow for the potential for future plume migration. [This distance is based upon average estimated groundwater flow rates of between one (1) foot per year and 10 feet per year, as presented in Section 8 of the RI Report. In other words, the down- gradient LUC boundary position would provide a physical buffer representing a time range of between 10 years and 100 years before contaminated groundwater could reach a down gradient LUC boundary.] The Air Force, consulting with

MDNR and USEPA, also has taken or will take into account existing property boundaries in establishing feasible LUC boundaries for restricting groundwater extraction and use.

(5) Communicating in writing, as soon as practicable concurrent with the transfer of fee title, information regarding necessary environmental use restrictions and controls to the property owners and MDNR and the City of Kansas City to ensure such agencies can factor the information into their oversight and decision-making activities regarding the property.

The Deed for SS006, SS012, ST005 and ST011 will include provisions for the release of the restrictive covenants when RACGs (see Table 2 below) have been achieved as indicated by two (2) consecutive sampling results of LTM; the proposed final remedy for OU-2 (LUCs) will remain in place until that time. Because LUCs will prohibit drilling of wells and extraction of groundwater for any use, there will be no complete exposure pathways for contaminated groundwater and human health and the environment will be protected. The contaminant concentrations will decrease over time via natural degradation processes because the groundwater contaminants are organic.

A LTM program will be implemented to support the LUCs and allow systematic, periodic evaluation of site groundwater quality to help ensure that the established LUC boundaries fully encompass the contaminant plumes and remain protective of human health and the environment, and to provide objective data to support termination of LUCs when RACGs have been achieved. The United States (Air Force or Navy) will consult with MDNR and USEPA regarding basic features of the LTM program, including, for example, the number and placement of monitoring wells, necessary analytical methods, and monitoring frequency based on assessed risk and the remedial action objectives identified in this ROD. Implementation of LTM will confirm that LUC boundaries encompass contaminant plumes or else indicate the need for possible additional actions should consecutive LTM results indicate that contaminant migration is occurring or soon will occur outside of the identified LUC boundaries.

2.14.3 Additional Performance Measures to Maintain, Monitor and Report on LUCs for Both OU-1 and OU-2

The United States (Air Force or Navy) will take the following actions and performance measures designed to confirm the appropriateness of the implementing actions, maintain the use restrictions and LUCs herein to continue to protect human health and the environment, and provide appropriate information to MDNR and USEPA on remedy status for the OU-1 and OU-2 sites subject to restrictions as described herein:

(1) Annual Evaluations/Monitoring: Compliance with and effectiveness of the use restrictions and controls will be evaluated by the Air Force on an annual basis until the first Five-Year Review. The five year review report will make recommendations on the continuation, modification, or elimination of monitoring frequencies and will be provided to USEPA and MDNR. The evaluation will address whether the use restrictions and controls described above were communicated in the property Deeds, whether the owners and affected state and local agencies were notified of the controls affecting the property, and whether use of the property has conformed with such controls. Such evaluation/monitoring will include visual inspection of the property, review of sampling results (if any), and whether there has been contact with owners or operators, etc.

(***2) Reporting Results of Monitoring:*** The monitoring results will be included in a separate report or as a section of another environmental report, if appropriate, and provided to MDNR and USEPA, for information only, on an annual basis unless the timing is mutually adjusted based on monitoring results or changes in risk or potential- risk at the sites. The report will evaluate the status of LUCs/use restrictions and how any LUC deficiencies or inconsistent uses have been or will be addressed (if not previously reported), in addition to the matters described in the preceding paragraph.

The annual monitoring reports will be used in preparation of the Five-Year Review to evaluate the effectiveness of the remedy. The Five-Year Review report will make recommendations on the continuation, modification, or elimination of annual reports and LUC monitoring frequency. The Five-Year Review report will be submitted to MDNR and USEPA for review and comment.

(3) Response to Violations: Violations of any control which result in an exposure to levels of contamination that the controls were intended to prevent (i.e., above RACGs), or discovery of any activity inconsistent with remedial action objectives or use restrictions here, will be reported to MDNR and local regulators as soon as practicable but no later than 10 days after the United States becomes aware of the violation or inconsistent use. Any violations that breach federal, state or local criminal or civil law will be reported to the appropriate civil authorities.

(4) Enforcement: Any activity that is inconsistent with the LUC objectives or use restrictions, or any other action that may interfere with the effectiveness of the LUCs will be addressed by the United States as soon as practicable after it becomes aware of the violation, with initial responsibility for correction resting on the then-current owner or occupant. If necessary, and in light of whatever other enforcement tools may be available to maintain the LUCs or use restrictions (such as USEPA or MDNR orders), the United States will exercise such rights as it retained under the transfer documents to direct that activities in violation of the controls be immediately halted. To the extent necessary, services of the Department of Justice will be engaged to enforce such rights. The Air Force will notify MDNR and USEPA regarding how the Air Force or others have addressed or will address the breach as soon as practicable, but no later than 30 days after sending MDNR and USEPA notification of the breach as stated in paragraph 3 above. Actions to correct activities inconsistent with IC objectives or use restrictions should be designed to maintain the same level of protectiveness of human health and the environment as the measures outlined in this ROD.

(5) Notification of Land Use Modification: Any non-Federal recipient of the property will obtain approval from Air Force, MDNR, and USEPA for any proposals for a land use change or activities (e.g., excavation) at a site inconsistent with the use restrictions and assumptions described in this ROD. For property being transferred to the Navy, the Navy will obtain approval from the MDNR and USEPA for any such proposals.

If the Air Force becomes aware that the then-current property owner or occupant of FT002 and ST005 proposes to excavate soils in a manner inconsistent with the restrictive covenants in the Deed prior to removal of the use restrictions, it will inform the property owner/occupant that such action must be approved by MDNR and taken in compliance with applicable federal and state requirements (including appropriate health and safety contingencies), and that the property owner/occupant may need to coordinate with the Air Force and regulators to seek a technical amendment, Explanation of Significant Difference, or ROD amendment under Section 300.435 of the National Contingency Plan for this ROD.

Documents created for the purpose of carrying out the LTM, as well as data gathered or reports generated as part of the LTM program, will be promptly shared with MDNR and USEPA for review and commment. If the data shows inconsistency with the assumptions described herein such that there is a risk to human health and the environment, the United States will comply with any necessary requirements for considering changes to a remedy under Section 300.435 of the National Contingency Plan (including MDNR and USEPA concurrence as outlined in that section).

The United States may arrange for third parties or other entities to perform any and all of the above actions. Any such arrangement shall be undertaken and executed in accordance with all applicable legal requirements, to include the Air Force's functions, obligations, and responsibilities under CERCLA.

2.14.4 Five-Year Review

Every five (5) years (at a minimum), the United States will conduct a review of the selected remedies in accordance with Section 121c of the CERCLA in conjunction with MDNR and USEPA. The performance of LUCs at the remaining OU-1 and OU-2 sites will be evaluated as part of the Five-Year Review to ensure continued protection of human health and the environment. Also, remedial progress and the need to continue LTM at OU-2 sites will be re-evaluated. In addition, modifications to the LTM program and LUC management will be coordinated with MDNR and USEPA consistent with CERCLA and NCP requirements.

2.15 Statutory Determinations

The selected remedies for the soils and groundwater are protective of human health and the environment, comply with federal and state requirements that are applicable or relevant and appropriate to the remedial action, and are cost effective. The selected remedy for OU-1 and OU-2 provides the best balance between cost and effectiveness of all the alternatives evaluated.

Until RACGs are achieved, contaminants will remain in the subject media at concentrations greater than those allowed for unrestricted land use. Therefore, a statutory review, according to Section 121c of CERCLA, will be performed within five (5) years after initiation of the remedial action, and every five (5) years thereafter, to ensure that the remedies are protective of human health and the environment.

Appendix C presents a list of applicable or relevant and appropriate regulations (ARARs) pertaining to the selected remedies for the two (2) OU-1 sites and the six (6) OU-2 sites.

2.16 Documentation of Significant Changes

There are no significant changes in this ROD from the Proposed Plan.

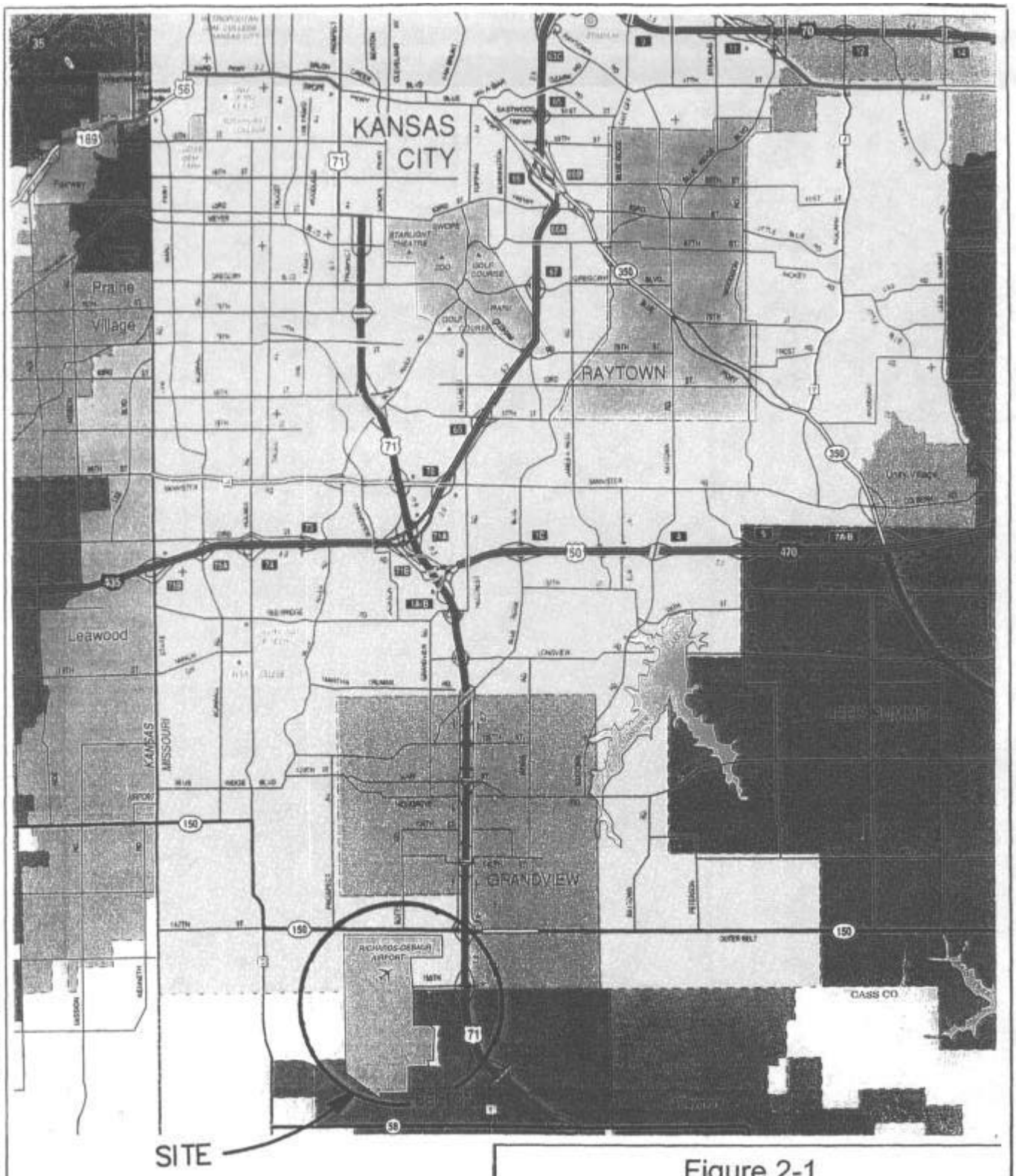


Figure 2-1

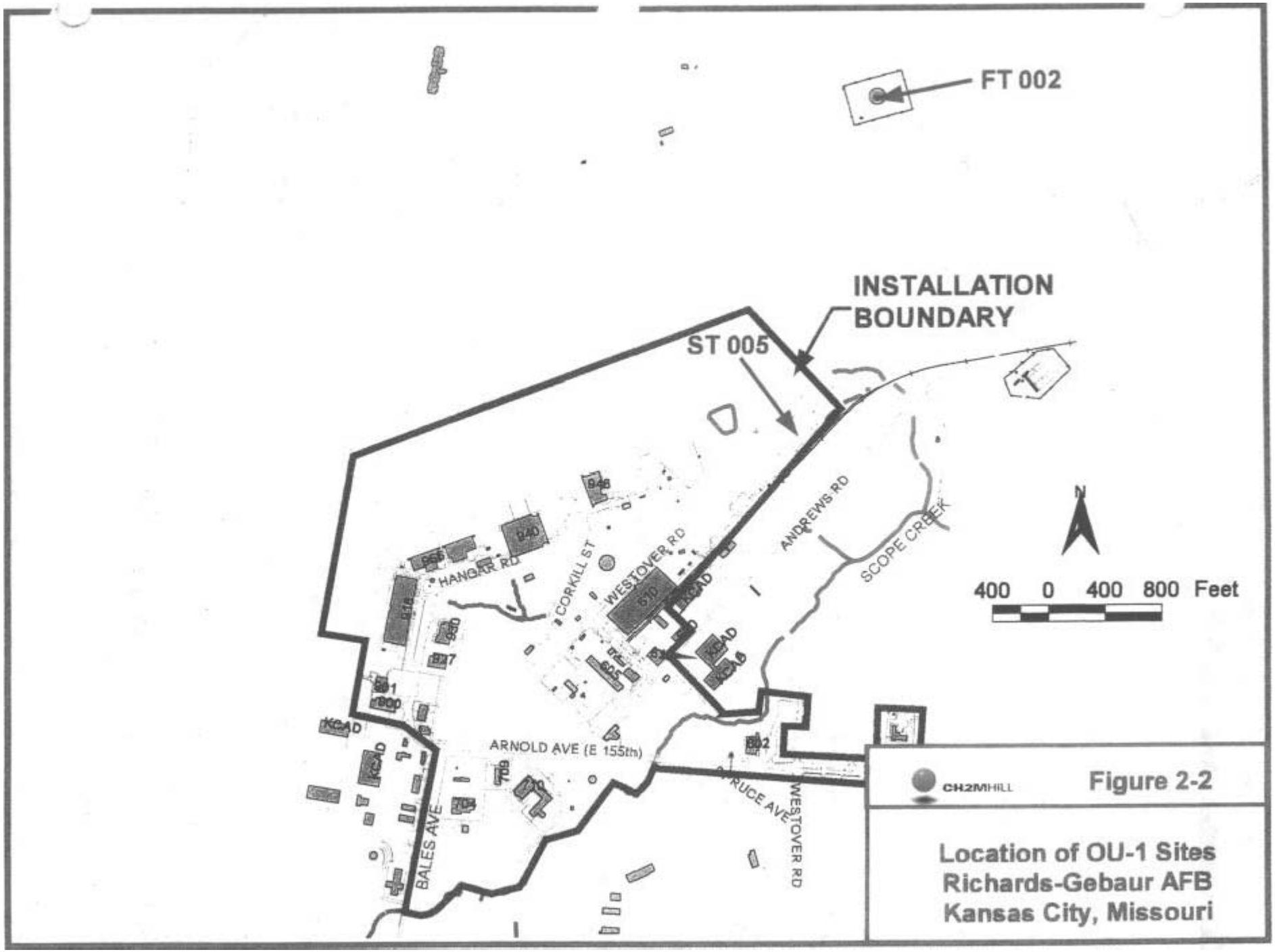
BASE LOCATION MAP

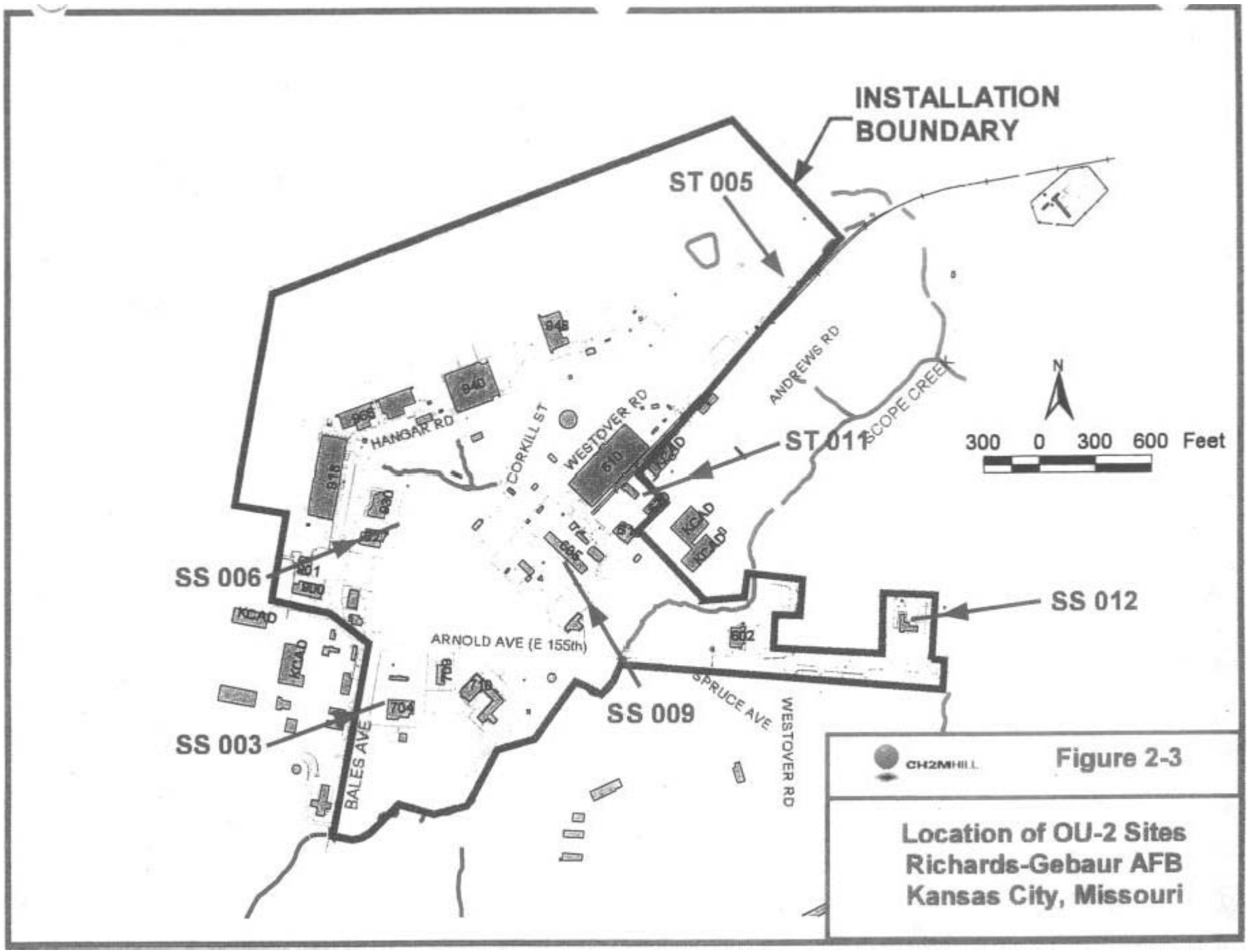
Richards–Gebaur AFB
Kansas City, Missouri

NOT TO SCALE

CH2MHILL

J:\153673\FIGURES\FIGURE3-1.DWG PLOT DATE: 10-26-98


FT 002
INSTALLATION BOUNDARY
ST 005
HANGAR RD
CORKILL ST
WESTOVER RD
ANDREWS RD
SCOPE CREEK
ARNOLD AVE (E 155th)
BALES AVE
BRUCE AVE
WESTOVER RD
N
400 0 400 800 Feet
CH2MHILL
Figure 2-2
Location of OU-1 Sites
Richards-Gebaur AFB
Kansas City, Missouri


INSTALLATION BOUNDARY
ST 005
ST 011
SS 006
SS 012
SS 009
SS 003
HANGAR RD
CORKILL ST
WESTOVER RD
ANDREWS RD
SCOPE CREEK
ARNOLD AVE (E 155th)
SPRUCE AVE
WESTOVER RD
BALES AVE
N
300 0 300 600 Feet
CH2MHILL
Figure 2-3
Location of OU-2 Sites
Richards-Gebaur AFB
Kansas City, Missouri

Note: The LUC boundaries displayed on this map are provisional. Final LUC boundaries will be established by a metes and bounds survey which will be completed within 60 days of signature of the ROD.

Legend

POL-V-W06D
3'-8' bgs
TPH: 461
Sample ID
Depth
Chemical Concentration (in ppm)

- IRA Excavation Floor Sample
- IRA Excavation Wall Sample
- TPH Concentration > 200 ppm
- IRA Limit
- Estimated Residual Contamination
- Provisional LUC Boundary

bgs Below Ground Surface

SB-008
17.5'-18.5' bgs
TPH: 1,143

SB-025
17.5'-18' bgs
TPH: 445

Former Waste Oil Tank (Removed)

Former Drain Line (Removed)

Former Discharge Line (Removed)

FTA-G-W02D
3'-6' bgs
TPH: 291

FTA-B-W01D
3'-6' bgs
TPH: 434

Former OWS (Removed)

Former Concrete Burn Pad (Removed)

Former AST (Removed)

Former Feed Line (Removed)

N

20 0 20 40 Feet

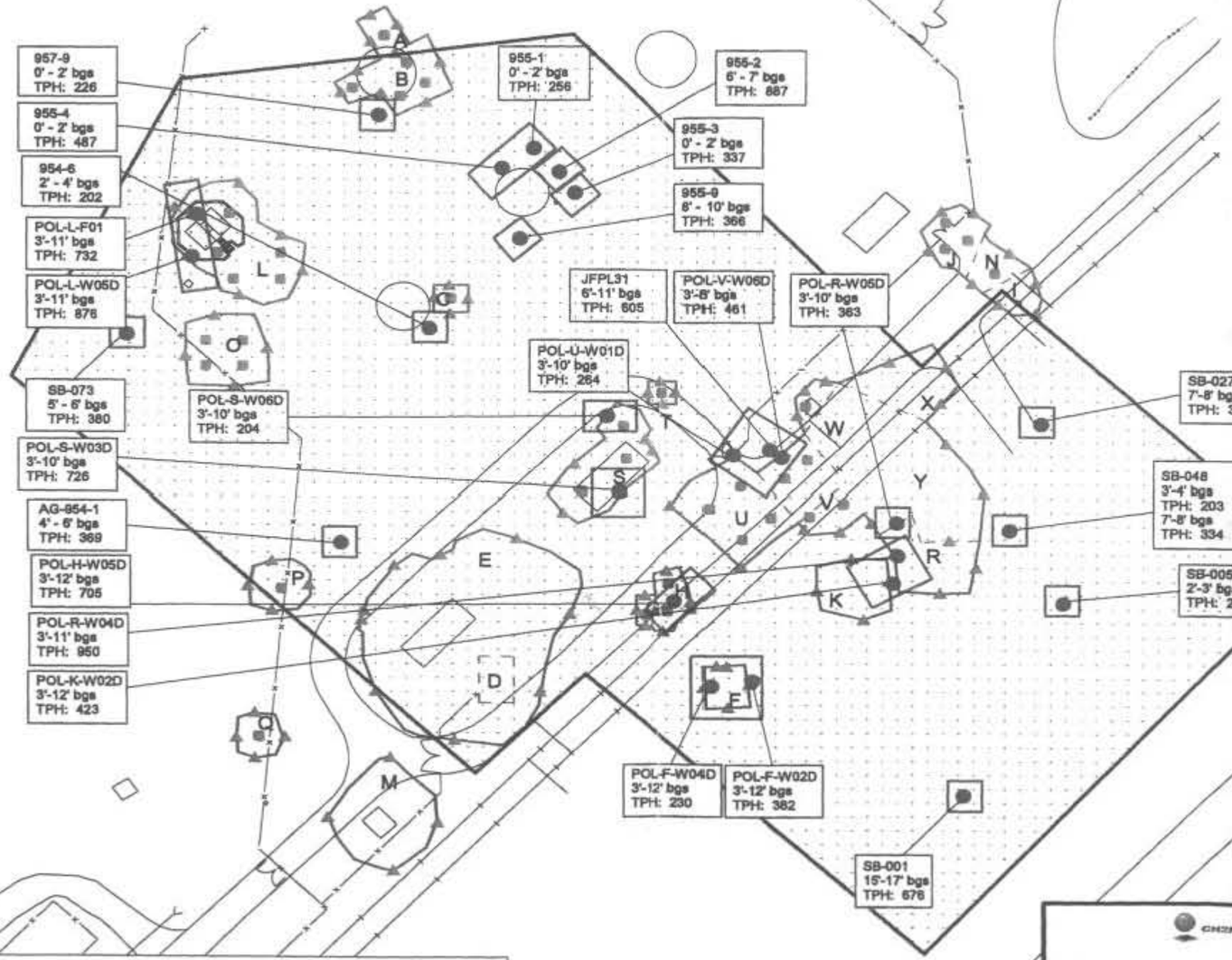
Estimated Volume of Residual Contamination = 170 cy

CH2MHILL

Figure 2-4

FT 002 - North Burn Pit
Residual Contamination Exceeding RACG in Soil
Richards-Gebaur AFB
Kansas City, Missouri

Note: The LUC boundaries displayed on this map are provisional. Final LUC boundaries will be established by a metes and bounds survey which will be completed within 60 days of signature of the ROD.



Legend

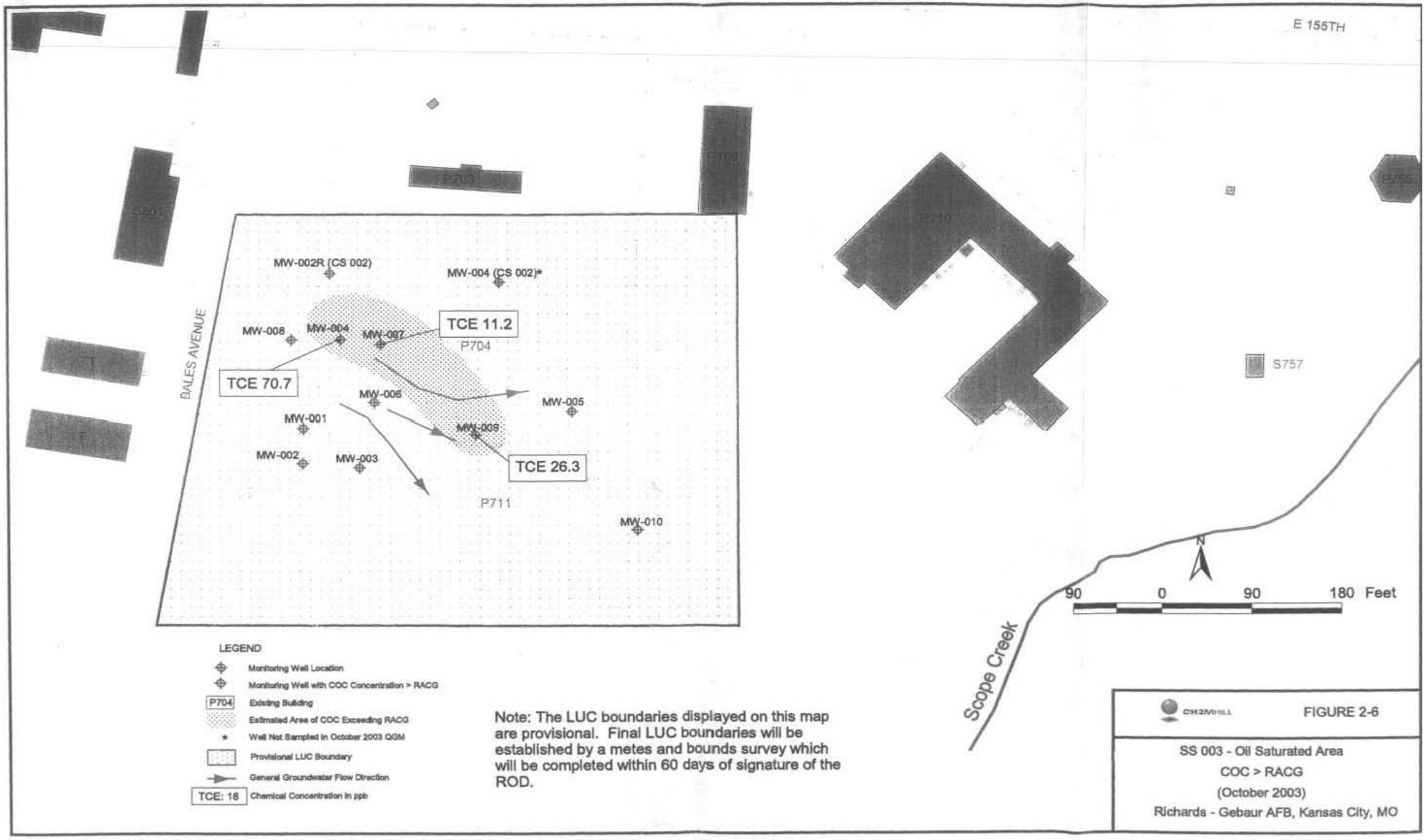
POL-V-W06D
3'-8' bgs
TPH: 461
Sample ID
Depth
Chemical Concentration (in ppm)

- IRA Excavation Floor Sample
- IRA Excavation Wall Sample
- TPH Concentration > 200 ppm
- IRA Limit
- Estimated Residual Contamination
- Provisional LUC Boundary
- bgs Below Ground Surface

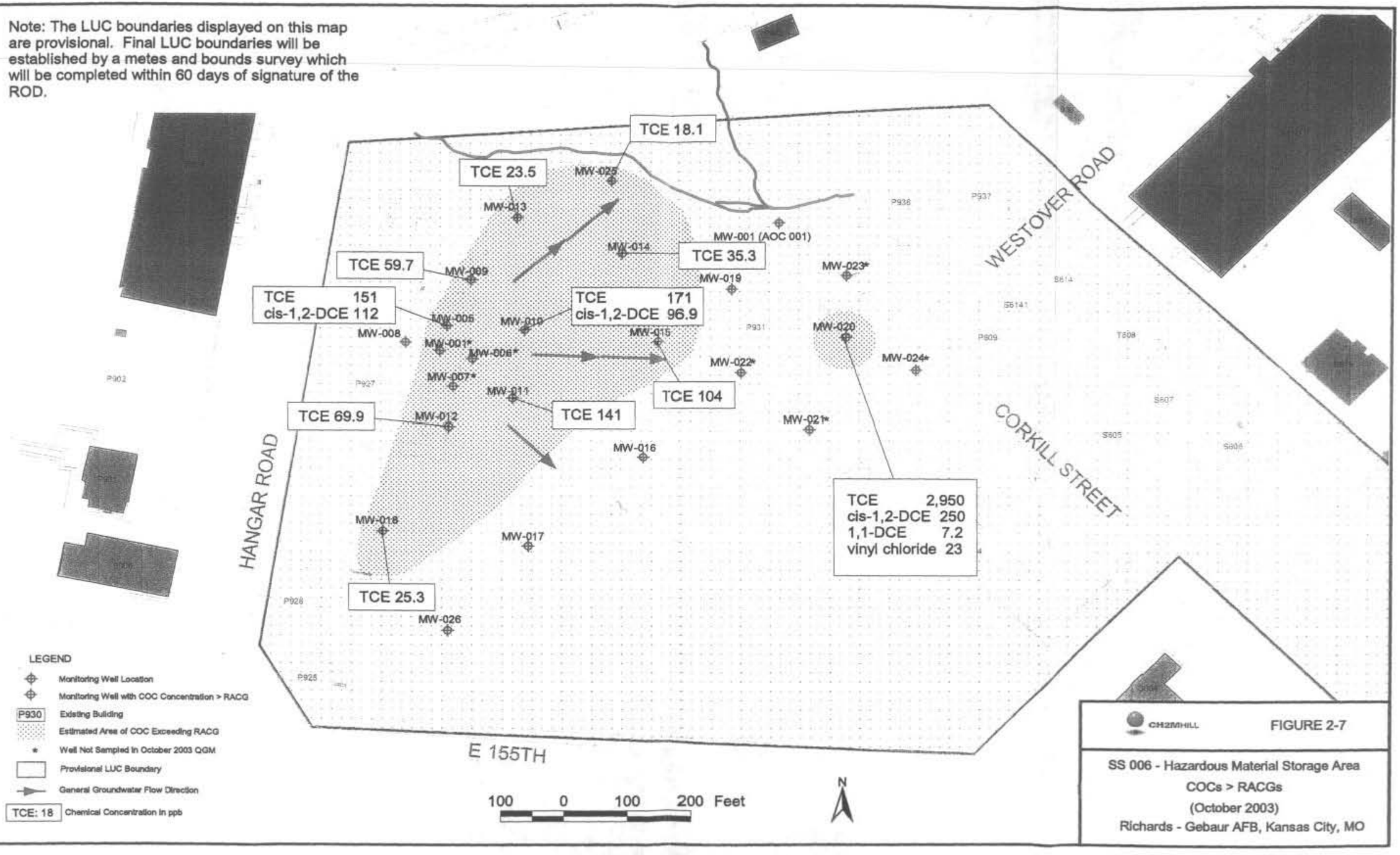
Estimated Volume of Residual Contamination = 3,200 cy

Figure 2-5

ST 005 - POL Storage Yard
Residual Contamination Exceeding RACG in Soil
Richards-Gebaur AFB
Kansas City, Missouri


E 155TH
P703
P702
S801
P710
P755
S757
MW-002R (CS 002)
MW-004 (CS 002)*
BALES AVENUE
MW-008
MW-004
MW-007
TCE 11.2
P704
TCE 70.7
MW-006
MW-005
MW-001
MW-009
MW-002
MW-003
TCE 26.3
P711
MW-010
N
90 0 90 180 Feet
Scope Creek
LEGEND
Monitoring Well Location
Monitoring Well with COC Concentration > RACG
P704 Existing Building
Estimated Area of COC Exceeding RACG
Well Not Sampled in October 2003 QGM
Provisional LUC Boundary
General Groundwater Flow Direction
TCE: 16 Chemical Concentration in ppb
Note: The LUC boundaries displayed on this map are provisional. Final LUC boundaries will be established by a metes and bounds survey which will be completed within 60 days of signature of the ROD.
CH2MHILL
FIGURE 2-6
SS 003 - Oil Saturated Area
COC > RACG
(October 2003)
Richards - Gebaur AFB, Kansas City, MO

Note: The LUC boundaries displayed on this map are provisional. Final LUC boundaries will be established by a metes and bounds survey which will be completed within 60 days of signature of the ROD.



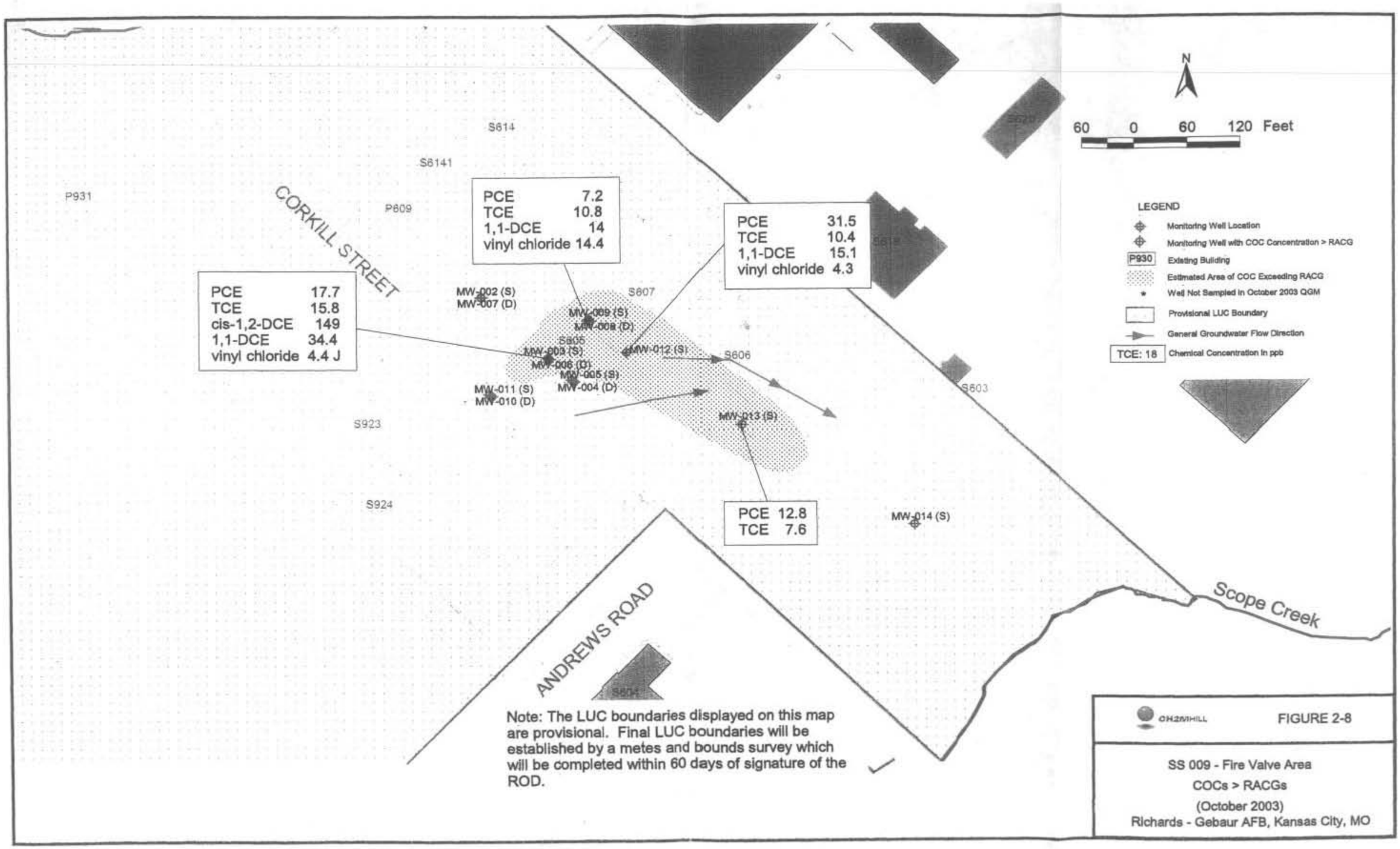
LEGEND

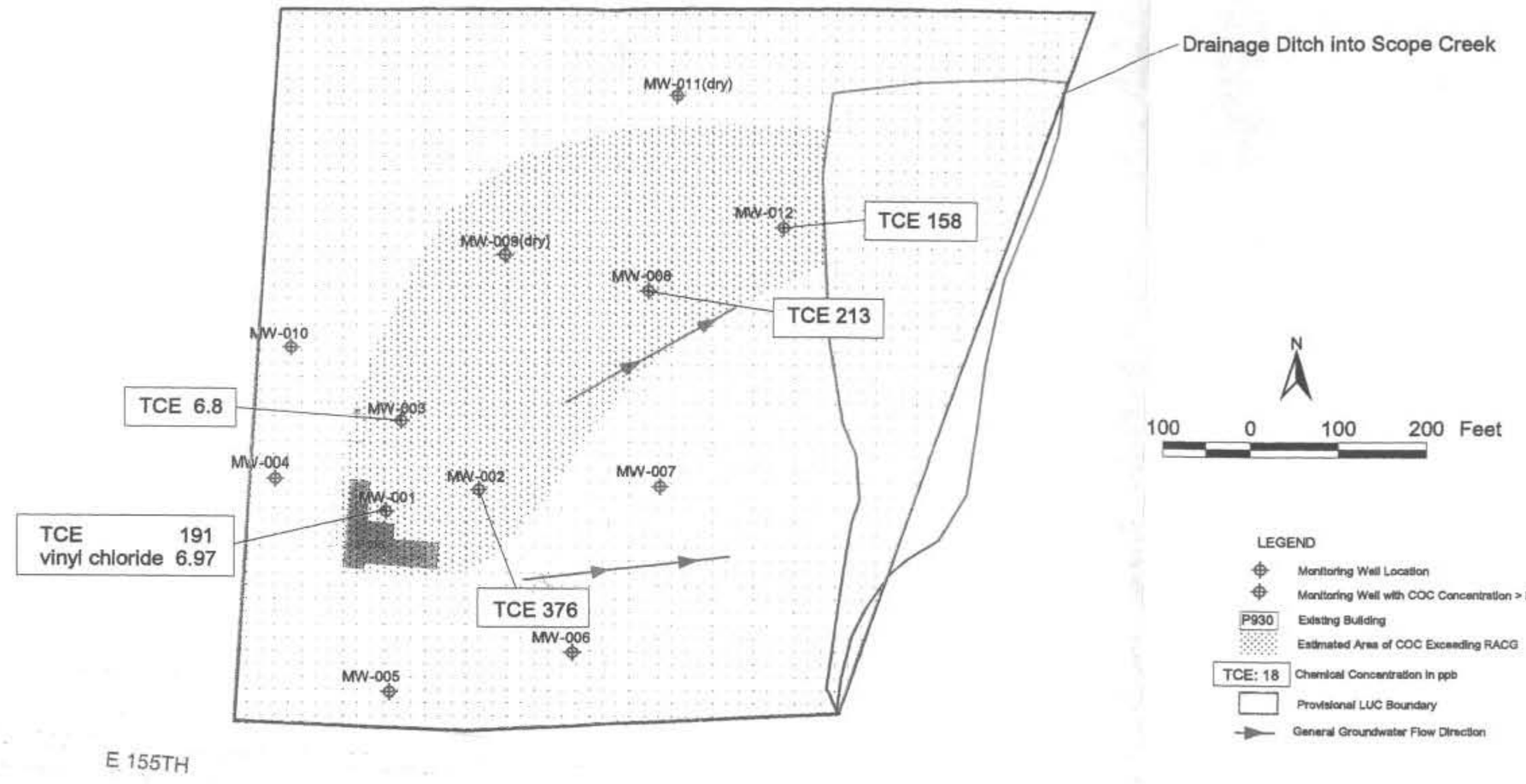
- Monitoring Well Location
- Monitoring Well with COC Concentration > RACG
- P930 Existing Building
- Estimated Area of COC Exceeding RACG
- * Well Not Sampled in October 2003 QGM
- Provisional LUC Boundary
- General Groundwater Flow Direction
- TCE: 18 Chemical Concentration in ppb

CH2MHILL

FIGURE 2-7

SS 006 - Hazardous Material Storage Area
COCs > RACGs
(October 2003)
Richards - Gebaur AFB, Kansas City, MO


S614
S6141
P931
P609
CORKILL STREET
PCE 7.2
TCE 10.8
1,1-DCE 14
vinyl chloride 14.4
PCE 31.5
TCE 10.4
1,1-DCE 15.1
vinyl chloride 4.3
PCE 17.7
TCE 15.8
cis-1,2-DCE 149
1,1-DCE 34.4
vinyl chloride 4.4 J
MW-002 (S)
MW-007 (D)
S607
MW-009 (S)
MW-008 (D)
S605
MW-003 (S)
MW-006 (D)
MW-005 (S)
MW-004 (D)
MW-012 (S)
S606
MW-011 (S)
MW-010 (D)
MW-013 (S)
S603
S923
S924
PCE 12.8
TCE 7.6
MW-014 (S)
ANDREWS ROAD
S604
Scope Creek
N
60 0 60 120 Feet
LEGEND
Monitoring Well Location
Monitoring Well with COC Concentration > RACG
P930 Existing Building
Estimated Area of COC Exceeding RACG
Well Not Sampled in October 2003 QGM
Provisional LUC Boundary
General Groundwater Flow Direction
TCE: 18 Chemical Concentration in ppb
Note: The LUC boundaries displayed on this map are provisional. Final LUC boundaries will be established by a metes and bounds survey which will be completed within 60 days of signature of the ROD.
CH2MHILL
FIGURE 2-8
SS 009 - Fire Valve Area
COCs > RACGs
(October 2003)
Richards - Gebaur AFB, Kansas City, MO

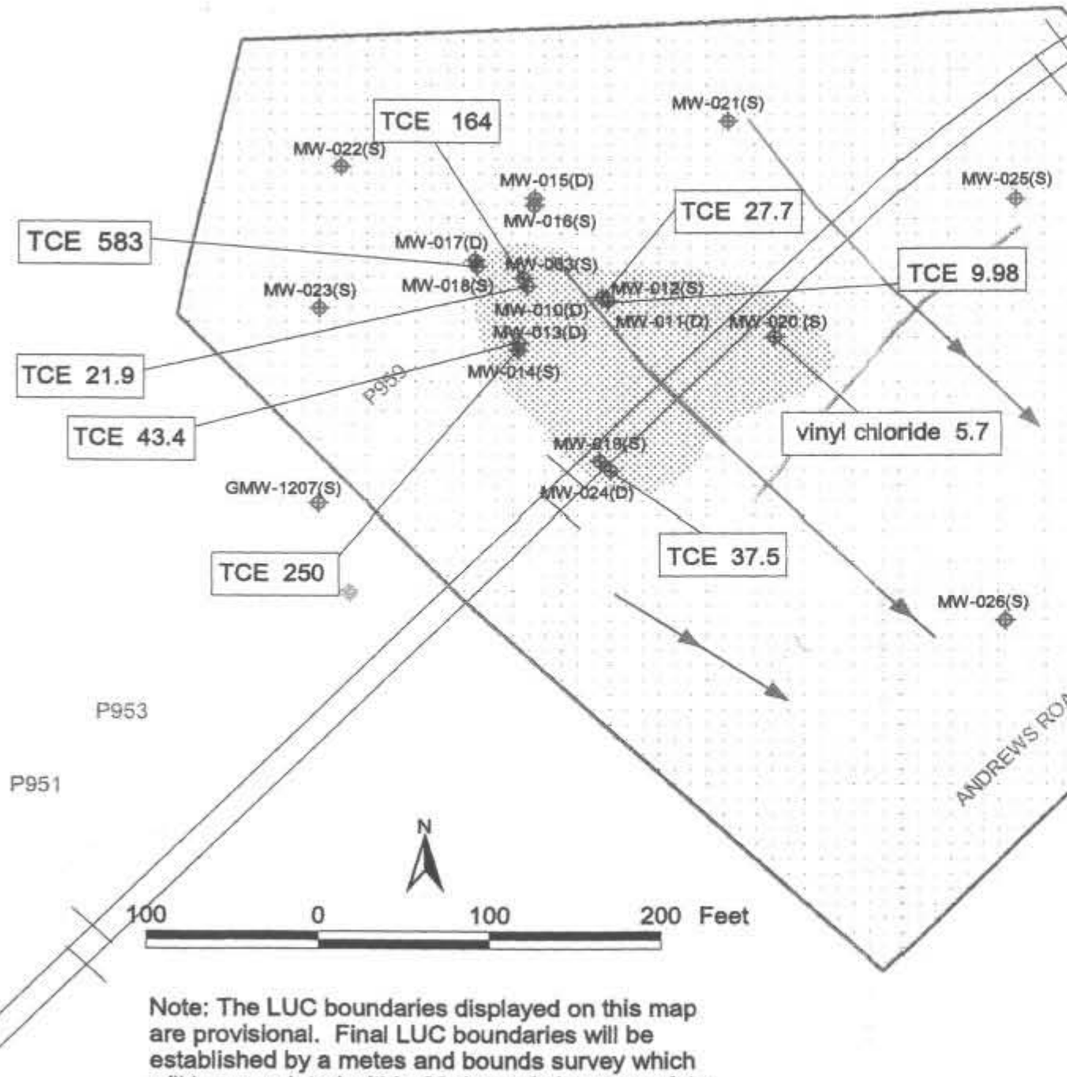


Note 1: The LUC boundaries displayed on this map are provisional. Final LUC boundaries will be established by a metes and bounds survey which will be completed within 60 days of signature of the ROD.

Note 2: MW-009, when not dry, has been consistently detected with TCE at levels exceeding RACG.

CH2MHILL FIGURE 2-9

SS 012 - Communications Facility at Building 105
COCs > RACGs
(October 2003)
Richards - Gebaur AFB, Kansas City, MO

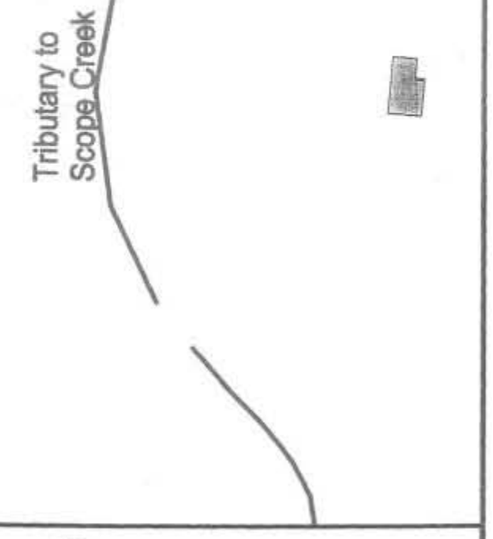


Note: The LUC boundaries displayed on this map are provisional. Final LUC boundaries will be established by a metes and bounds survey which will be completed within 60 days of signature of the ROD.

ST 005 in Relation to Scope Creek

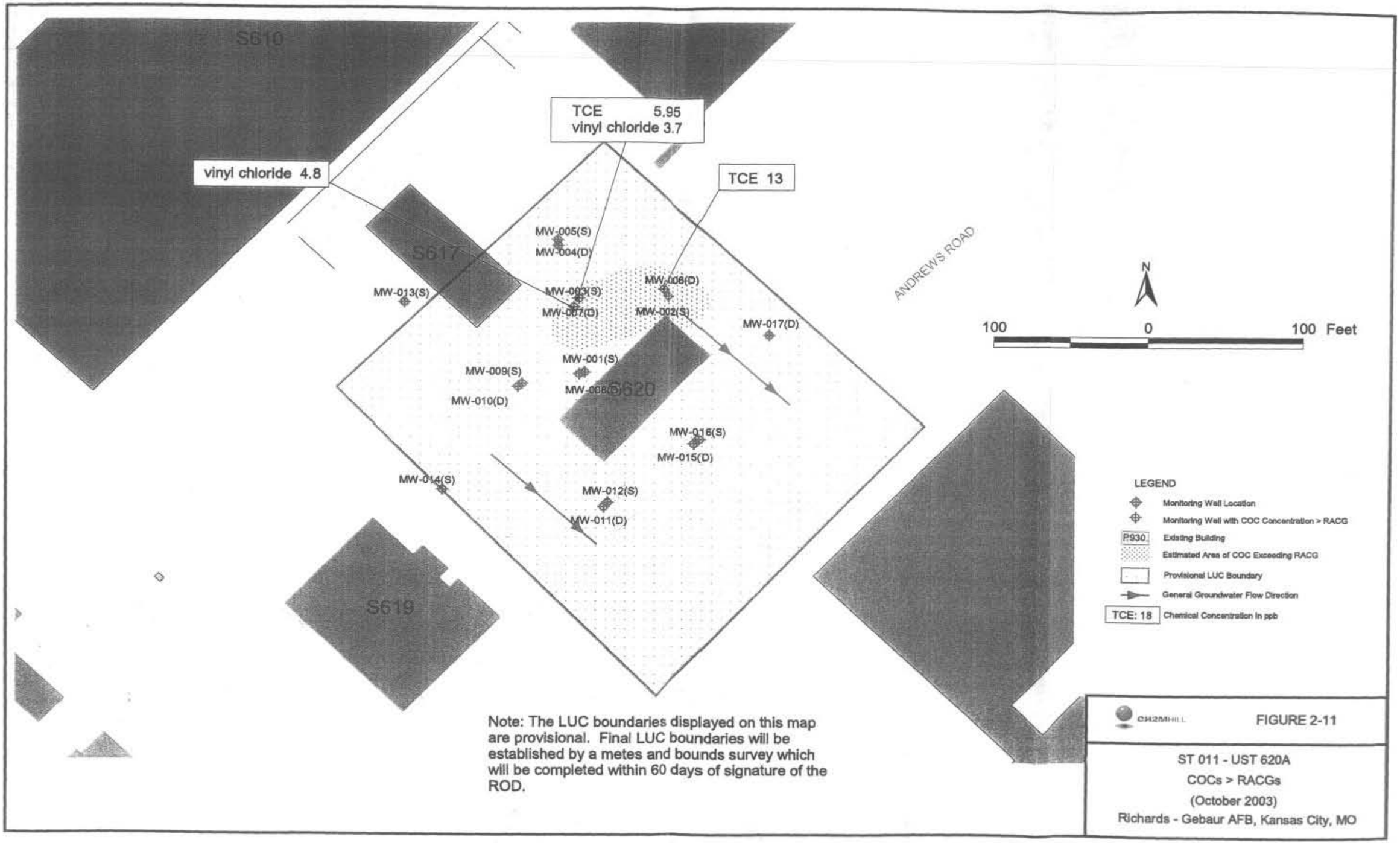
LEGEND

- Monitoring Well Location
- Monitoring Well with COC Concentration > RACG
- P930 Former Structure
- Estimated Area of COC Exceeding RACG
- TCE: 18 Chemical Concentration in ppb
- Provisional LUC Boundary
- General Groundwater Flow Direction



CH2MHILL FIGURE 2-10

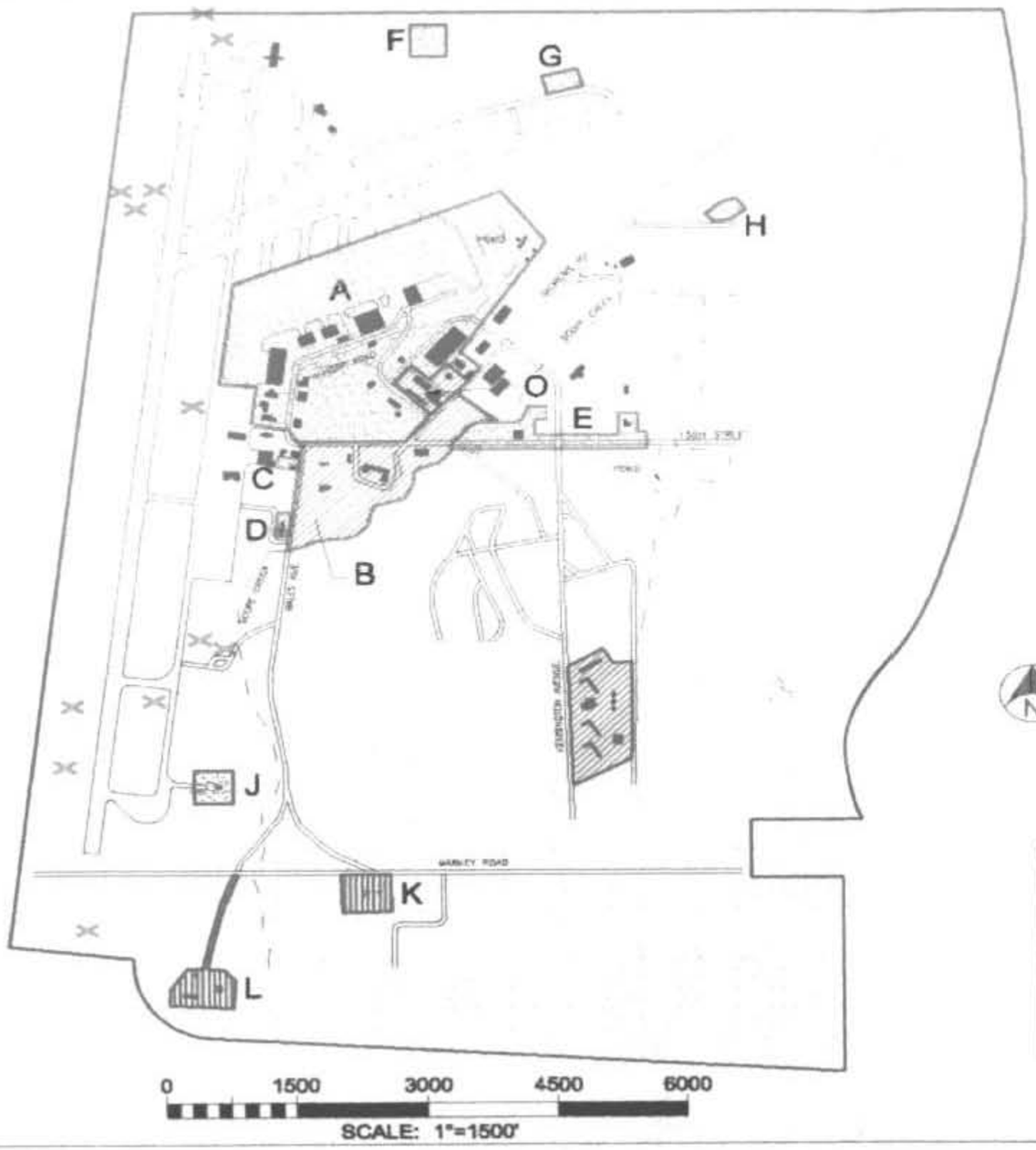
ST 005 - POL Storage Yard
COCs > RACGs
(October 2003)
Richards - Gebaur AFB, Kansas City, MO



Note: The LUC boundaries displayed on this map are provisional. Final LUC boundaries will be established by a metes and bounds survey which will be completed within 60 days of signature of the ROD.

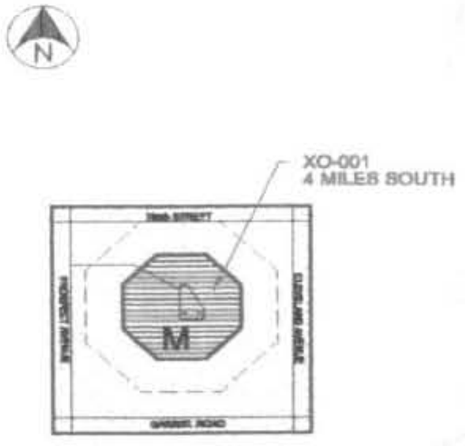
CH2MHILL FIGURE 2-11

ST 011 - UST 620A
COCs > RACGs
(October 2003)
Richards - Gebaur AFB, Kansas City, MO



LEGEND

- CURRENT AIR FORCE PROPERTY (PARCELS A, C, E, F, G, H, AND J)
- FEDERAL TRANSFER (U.S. MARINE CORPS) (PARCELS B, D, I, AND O)
- NEGOTIATED SALE (CITY OF BELTON, MO) (PARCELS K AND L)
- FEDERAL TRANSFER (DEPARTMENT OF THE ARMY) (PARCEL M)
- PREVIOUSLY CONVEYED RICHARDS-GEBAUR AFB PROPERTY
- FORMER NAVIGATIONAL AID EQUIPMENT SITE
- BELTON TRAINING COMPLEX PROPERTY EASEMENT BOUNDARY (TO BE CONVEYED WITH PARCEL)
- H PARCEL LABEL
- FACILITY



NOT TO SCALE

Parcelization of
Richards-Gebaur AFB
Richards-Gebaur AFB, Missouri
October 2002
CH2MHILL

3. Responsiveness Summary

The public comment period for the Proposed Plan began on December 9, 2002 and ended on January 9, 2003. A public notice summarizing the Proposed Plan, and announcing the public comment period and associated public meeting, was printed in the Kansas City Star on December 7, 2002 and the Belton Star Herald on December 12, 2002.

At the public meeting, which was held on December 12, 2002, questions and comments relating to the Proposed Plan were received from the audience.

3.1 Stakeholder Comments and Lead Agency Responses

Following the Proposed Plan availability session and 30-day public comment period, the Air Force received a single letter from the Director of Public Works, City of Grandview, Missouri. The letter expressed the City's concerns that residual soil and groundwater contamination were being left untreated at the two (2) OU-1 and six (6) OU-2 sites. Accordingly the City stated its preference for OU-1 Alternative S3 (Excavation and Landfill Disposal) and OU-2 Alternative G3 (LUCs and Accelerated Natural Attenuation (supported by LTM)).

In its response, the Air Force indicated that the two (2) sites with the remaining soil contamination (OU-1) had been successfully remediated to standards consistent with the planned re-use of the property – that is, commercial and light industrial. Regarding the residual contamination present in groundwater (OU-2), the Air Force explained that the site conditions were not suitable for groundwater treatment, and that the selected remedy – LUCs (supported by LTM) – would be protective of human health and the environment by preventing extraction and use of the contaminated groundwater at the six (6) sites in question.

Please refer to Appendix B for copies of these letters.

3.2 Technical and Legal Issues

None.

4. References

AFCEE, 1997. *Air Force Center for Environmental Excellence (AFCEE) Guidance for Risk Assessment*.

ASTM, 1998. *American Society for Testing and Materials (ASTM) Risk-based Corrective Action (RBCA) Guidance.*

Booz Allen & Hamilton, Inc., 2000. *Visual Site Inspection at Facility 105, Richards-Gebaur AFB, Missouri, October 24, 2000. GSA Contract No. GS 10F0090J, Delivery Order No. DASW01-00-5105.*

Burns & McDonnell, 1992a. *Interim Remedial Action for SS003, Oil Saturated Area & SS004, Hazardous Waste Drum Storage, Final Closure Report.*

Burns & McDonnell, 1992b. *IRP Remedial Investigation Site ST005, POL Storage Yard, Richards-Gebaur Air Force Base, Missouri, Final Report, Kansas City, Missouri.*

Burns & McDonnell, 1993. *Water Course Soil Assessment, Phase ll Final Report, Richards- Gebaur Air Force Base, Missouri.*

Burns & McDonnell, 1994. *Closure Report, Building 620.*

CCI, 2001. *Community Relations Plan for the Former Richards-Gebaur Air Force Base, Air Force Conversion Agency, Kansas City, MO.*

CH2M HILL, 1983. *Installation Restoration Program Records Search for Richard-Gebaur Air Force Base, Missouri.*

CH2M HILL, 2001-2003. Results of Quarterly Groundwater Monitoring at Richards-Gebaur Air Force Base.

CH2M HILL, 2001a. *Final Basewide Remedial Investigation Report, Richards-Gebaur Air Force Base, Missouri.*

CH2M HILL, 2001b. *Final Removal Actions for Soils and Sediments (Operable Unit-1), Engineering Evaluation / Cost Analysis (EE/CA), Richards-Gebaur Air Force Base, Missouri.*

CH2M HILL, 2002a. *Final Focused Feasibility Study for Soils (Operable Unit-1), Richards- Gebaur Air Force Base, Missouri.*

CH2M HILL, 2002b. *Final Feasibility Study for Groundwater (Operable Unit -2), Richards- Gebaur Air Force Base, Missouri.*

CH2M HILL, 2002c. *Final Basewide Remedial Investigation (RI) Report Addendum, Richards-Gebaur Air Force Base, Missouri.*

CH2M HILL, 2002d. *Proposed Plan for Richards-Gebaur Air Force Base, MO.*

CH2M HILL, 2002e. *Environmental Baseline Survey (EBS) Category 5-7 Sites Investigation Report, Richards-Gebaur Air Force Base, Missouri.*

CH2M HILL, 2003a. *Draft Long Term Monitoring Plan for Groundwater (Operable Unit 2), Richards-Gebaur Air Force Base, Missouri*.

CH2M HILL, 2003b. *Interim Action Report for Soils and Sediments (Operable Unit-1), Richards-Gebaur Air Force Base, Missouri*.

CH2M HILL, 2003c. *Draft No Further Response Action Planned Decision Document, Site AOC 001, Central Drainage Area, Richards-Gebaur Air Force Base, Missouri.*

CH2M HILL, 2003d. *Draft No Further Response Action Planned Decision Document, Site AOC 002, North Drainage Area, Richards-Gebaur Air Force Base, Missouri*.

CH2M HILL, 2003e. *Draft No Further Response Action Planned Decision Document, Site OT 010, Former Small Arms Firing Range, Richards-Gebaur Air Force Base, Missouri*.

CH2M HILL, 2003f. *Draft No Further Response Action Planned Decision Document, Site ST 007, Former UST Area, Richards-Gebaur Air Force Base, Missouri*.

Dames & Moore, 1996a. *Final Data Report, Former Fire Pit Product Line Cleaning*.

Dames & Moore, 1996b. *Draft Report POL Yard Phase I/ll Soil Characterization*.

Dames & Moore, 1996c. *Final Data Report, Building 620 Soil Removal, Richards-Gebaur Air Force Base*

Ecology & Environment, 1988. *Installation Restoration Program Phase ll Confirmation / Quantification, Stage 2, Richards-Gebaur Air Force Base, Kansas City, Missouri- Final Report. Volume I-ll and Supplement.*

Esch, P. Mark, 1996. *Internal Air Force Memorandum*.

Gentile, R.J. et. al., 1991. Hydrogeologic Analysis of Richards-Gebaur AFB, Missouri.

Gentile, R.J., 1998. Geology of the Richards-Gebaur Air Force Base, Missouri.

HDB Construction, Inc. and Environmental Services, 1996. *Analytical Data Report, Subsurface Assessment, Richards-Gebaur, Richards-Gebaur Memorial Airport, Call: H-002-Underground Storage Tank Sites, Kansas City, Missouri.*

Jacobs Engineering Group, 1995. *Groundwater Evaluation Report (Revised), Richards-Gebaur Air Force Base, Kansas City, Missouri*.

MDNR, 1997. *Missouri State Water Plan Series, Volume Ill, Missouri Water Quality Assessment.*

MDNR, 2001. *Clean-up Levels for Missouri (CALM) Guidance.*

O'Brien & Gere, 1991. *Remedial Investigation (RI) at R-G AFB, Belton, MO for FT002 - North Burn Pit, SS003—Oil Saturated Area, SS004—Hazardous Waste Drum Storage, ST005—POL Storage Yard.*

Tetra Tech, Inc., 1995. *Installation Restoration Program (IRP) Preliminary Assessment/ Site Inspection of IRP Site SS009, Richards—Gebaur Air Force Base, Missouri*.

URS-Dames & Moore, 2003. *Technical Memorandum Summary of Remedial Investigation for Facility 1033.*

USEPA, 1989. *Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs), 1989 Update, EPA/625/3-89/016.*

USEPA, 1992. *Community Relations in Superfund: A Handbook.*

US Army Corps of Engineers, 1989. *Soil Samples at the POL Storage Yard. Kansas City, Missouri*.

US Air Force, 1993. *Basewide Environmental Baseline Survey, Richards-Gebaur Air Force Base, Missouri.*

US Air Force, 1994a. *BRAC Clean-up Plan (BCP), Richards-Gebaur Air Force Base, Kansas City, Missouri.*

Versar, 1996. Groundwater Assessment, SS003, SS004, SS006, and SS009 (draft).

Appendix A – Concurrence Letter from MDNR and USEPA

Appendix B – Public Comments on the Proposed Plan and Response Letter from USAF

CITY OF GRANDVIEW

1200 Main Street
Grandview, Missouri 64030-2498
(816) 316-4800

December 10, 2002

Mr. Paul Carroll/Site Manager
Air Force Real Property Agency/DC-Reese
9801 Reese Blvd., North, Ste. 300
Lubbock, TX 79416

RE: Public comment on the "Proposed Plan for Richards-Gebaur AFB, MO"

Dear Mr. Carroll;

The City of Grandview reviewed the " Proposed Plan for Richards-Gebaur AFB, MO" regarding the six remaining soil and groundwater contaminated sites at the former Richards-Gebaur Air Force Base. The soil contaminated site FT 002 - North Burn Pit was the site of the former USAF fire department. Training was performed at this site that included flooding the area with combustible fuels then igniting that fuel. The site still contains TPH compounds in excess of standards.

The second contaminated site, ST 005 - POL Yard, formerly an above ground fuel depot, has both soil and groundwater contamination. It is believed that both the soil and groundwater were contaminated by fuel spills. The site still contains TPH compounds in excess of standards.

The remaining groundwater contaminated sites include SS 003 - Oil Saturated Area adjacent to a former waste oil storage site, SS 066 - Hazardous Material Storage Area where a spill occurred in the 1980s, SS 099 - Fire Valve Area where the source of VOC groundwater contamination is unknown, SS 012 - Communications Facility where the source of VOC groundwater contamination is also unknown, and ST 011 - UST 620A another fuel depot. All these sites remain contaminated.

Grandview believes that merely restricting future land use and monitoring is insufficient. Increased cancer risks of 3 per 1000 may be acceptable to the USAF but it is not for the residents of Grandview. Grandview does not concur with your recommended Alternative 2 of Land Use Control and request that the S3 alternative of Excavation and Landfill Disposal of the soil contaminated sites and G3 alternative of Land Use Controls, Accelerated Natural Attenuation and Groundwater Monitoring of the groundwater contaminated sites be re-evaluated.

Very truly yours,

Lawrence N. Creek, PE
Director of Public Works

Cc: Harry O. Wilson, Mayor
Board of Aldermen
Cory Smith, City Administrator

January 9, 2003

Lawrence N. Creek, P.E.
Director of Public Works
City of Grandview
1200 Main Street
Grandview, MO 64030

Dear Mr. Creek:

Thank you for your letter dated December 10, 2002, in which you provide comments on the Proposed Plan for Richards-Gebaur Air Force Base (RGAFB). The Proposed Plan addresses contamination remaining at seven sites at RGAFB. The Air Force would like to respond to the issues raised in your letter and provide some additional information to help explain the rationale for the preferred remedial alternatives.

The project cleanup goals were established mutually by the Missouri Department of Natural Resources (MDNR), U.S. Environmental Protection Agency (USEPA), and the Air Force in the 2002 Feasibility Study (FS) and Focused Feasibility Study (FFS) reports. These goals were generally met or exceeded at each of the sites at RGAFB, and the implementation of the preferred remedial alternatives will be protective of human health and the environment under future commercial land use scenarios. As described below, the increased cancer risk referenced in your letter represents a worst-case exposure scenario that will be effectively mitigated by the proposed land use controls.

State and Federal regulations require that the Air Force restore the RGAFB property to a level that is consistent with the planned reuse. The anticipated future land use at RGAFB is a mixture of commercial and light industrial businesses according to existing reuse plans for the Base. Accordingly, cleanup goals for each site were established consistent with the planned reuse of the property – namely commercial. Furthermore, for sites with soil contamination, the Air Force directed its contractors to remove additional volumes of contaminated soil to attempt to reach residential cleanup standards wherever practical.

For contaminated soil sites, commercial cleanup standards were met at four of the six sites in question. In fact, although not required at these four sites, cleanup was expanded and residential land use standards were achieved allowing unrestricted reuse of the sites. However, because of the presence of bedrock, buried utilities, and depth of residual contamination, soil removal to reach commercial land use standards was not practical everywhere at Sites FT 002 (North Bum Pit) and ST 005 (POL Yard). It is important to realize that, at both sites, the vast majority of land was successfully remediated to meet, at a minimum, commercial standards and that only isolated or inaccessible soil sample locations remain in excess of commercial standards.

The remaining soil contamination poses no risk to the residents of Grandview unless they excavate the contaminated soil and fail to take appropriate safety precautions in handling the excavated material. Land use controls for these sites will be designed to preclude such activities and will effectively mitigate the potential risk posed by the contamination.

With regard to contaminated groundwater sites, hydrogeologic conditions were evaluated over several years through a series of tests and monitoring events and were found to be unsuitable for active remedial approaches that rely on moving fluids either into or out of the subsurface formations. This evaluation is detailed in the 2002 Feasibility Study report and received concurrence from both the MDNR and USEPA. As a consequence, it was concluded that groundwater treatment via accelerated natural attenuation was unlikely to prove successful and, furthermore, would extend the project several years into the future and prevent timely reuse of the property by the local communities.

The contaminated groundwater poses no risk to the residents of Grandview unless they install a well in the contaminated area, and extract the contaminated groundwater for their use. The quoted risk of an additional 3 cases of cancer per 1,000 residents is an upper- bound estimate of risk based upon a lifetime's consumption of groundwater contaminated with the maximum detected concentration of volatile organic chemicals (VOCs) found in the groundwater (the lower-bound estimate would be zero cases). This is considered a conservative analysis since shallow groundwater is not used locally for residential purposes because it is of poor production quality; and because the communities of Kansas City, Grandview, and Belton obtain residential water supplied by the City of Kansas City.

Land use controls for these sites will be designed to preclude the installation and use of groundwater wells in the contaminated areas and thus will effectively mitigate the potential risks posed by the groundwater. Imposing deed restrictions and permit prohibitions on water well drilling at each of the six sites will preclude future human exposure to the underlying contaminated groundwater. Long-term groundwater sampling and monitoring will ensure that concentrations of contaminants in groundwater remain stable or decrease and that contaminant plumes do not expand or migrate unexpectedly.

In summary, the Air Force believes that implementation of land use controls, as described in the Proposed Plan, will effectively mitigate the risks posed by the remaining contamination, and additional active remediation is not warranted. The Air Force appreciates the City of Grandview's concerns and hopes that the above information adequately addresses the issues that were raised. If you have any further concerns, please do not hesitate to contact me at (806) 885-5010.

Sincerely,

Paul Carroll
Site Manager - Air Force Real Property Agency

Appendix C – Applicable, Relevant, and Appropriate Requirements (ARARs)

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
Richards-Gebaur AFB

Media	Requirement	Requirement Synopsis
Chemical-Specific ARARs		
Soil	***State***	
	Missouri UST Act (Sect. 644 RSMo)	The original UST Law was passed in 1989. Technical requirements are incorporated within the mandate of the Missouri Clean Water Act.
	Rules of (Missouri) Department of Natural Resources, Division 20-Clean Water Commission, Chapter 10-Underground Storage Tanks-Technical Regulations (10 CSR 20.10)	This rule contains the technical standards for USTs. This rule is designed specifically to protect the quality of groundwater in the state as well as to protect human health and the overall quality of the environment.
	MDNR, UST Closure Guidance Document, Division of Environmental Quality, Hazardous Waste Program, March 1996	Provides sections on UST closure checklist, UST closure requirements, UST registration and fees, notification requirements for UST closure, UST closure using Industry Standards, Sampling and Analysis, Treatment and Disposal, UST Closure Report, and references.
	Missouri Department of Health, Division 20-Division of Environmental Health and Epidemiology, Any-Use Soil Levels (ASLs) for Residential Settings (19 CSR 20-9.020)	Provides the levels and protocols used by the MNDR to determine the concentrations of specific chemicals that may be safely left in onsite soils. ASLs were developed to assist MDNR under the MHWML Section 260.445.5 for use at Abandoned or Uncontrolled Hazardous Waste Disposal Sites (10 CSR 25-10.010). The ASLs will be used as To-be-considered (TBC) guidance.
	MDNR, CALM, Division of Environmental Quality, Hazardous Waste Program, September 1998	The CALM guidance document outlines a process for determining cleanup goals at sites with known or suspected hazardous substance contamination. The CALM process was developed for hazardous substance contamination which is remediated under Missouri's VCP laws and regulations (10 CAR 25-15.010). The CALM guidance will be used as TBC guidance.
Groundwater	***Federal***	
	Federal Safe Drinking Water Act MCLs (40 CFR 141.11—141.16)	This act consists of promulgated standards or levels (concentrations) for a broad range of COCs in public drinking water supplies. It may be considered relevant and appropriate for groundwater aquifers used for drinking water. The site groundwater is not used and will not likely be used as a drinking water source in the future.
	State	
	Missouri Safe Drinking Water Act (Sect. 643 RSMo)	Passed in 1979, but its original authority dates back to 1939. It is implemented by the MDNR's Division of Environmental Quality as the Public Drinking Water Program. The law parallels its federal equivalent and stipulates maximum and secondary contaminant levels and monitoring requirements for public drinking water systems.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
Richards-Gebaur AFB

Media	Requirement	Requirement Synopsis
Groundwater	MDNR, UST Closure Guidance Document, Division of Environmental Quality, Hazardous Waste Program, March 1996	Provides sections on UST closure checklist, UST closure requirements, UST registration and fees, notification requirements for UST closure, UST closure using Industry Standards, Sampling and Analysis, Treatment and Disposal, UST Closure Report, and references.
	MDNR, CALM, Division of Environmental Quality, Hazardous Waste Program, September 1998	The CALM guidance document outlines a process for determining cleanup goals at sites with known or suspected hazardous substance contamination. The CALM process was developed for hazardous substance contamination which is remediated under Missouri's Voluntary Cleanup Program laws and regulations (10 CAR 25-15.010).
Location-Specific ARARs		
All forms of media at the site	***Federal***	
	Migratory Bird Treaty Act of 1972, (16 USC Section 703)	This act protects almost all species of native birds in the U.S. from unregulated "taking" which can include poisoning at contaminated or hazardous waste sites.
	Protection of Floodplains, Executive Order 11988 (40 CFR 6, Appendix A)	Appendix A of 40 CFR 6 sets forth policy for carrying out provisions of the Protection of Floodplains Executive Order. Under this order, federal agencies are required to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values of the floodplain. Agencies are also required to circulate a notice explaining why action within the floodplain is proposed.
	State	
	Wildlife Code of Missouri (3 CSR 10-4)	Endangered species in Missouri.
Surface Water and Wetlands	***Federal***	
	Fish and Wildlife Coordination Act (16 USC 661 et seq.)	This act provides protection and consultation with the US Fish and Wildlife Service and state counterpart for actions that would affect streams, wetlands, other water bodies, or protected habitats. Action taken should protect fish or wildlife, and measures developed to prevent, mitigate, or compensate for project-related losses to fish and wildlife.
Wetland Sediment and Surface Water	***Federal***	
	Protection of Wetlands - Executive Order 11990 (40 CFR 6, Appendix A)	Appendix A of 40 CFR 6 sets forth policy for carrying out provisions of the Protection of Wetlands Executive Order. Under this order, federal agencies are required to minimize the degradation, loss, or destruction of wetlands, and to preserve the natural and beneficial values of wetlands. Appendix A requires that no remedial alternatives adversely affect a wetland if another practicable alternative is available. If no alternative is available, effects from implementing the chosen alternative must be mitigated. Public notice and review of activities involving wetlands is required.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
Richards-Gebaur AFB

Media	Requirement	Requirement Synopsis
Wetland Sediment and Surface Water	Endangered Species Act (16 U.S.C. 460 et seq.)	Passed in 1973. It establishes a program for the conservation of endangered and threatened plants and animal, and the habitats that support them. The Act is administered by the National Marine Fisheries Services and the U.S. Fish and Wildlife Service. The Fish and Wildlife Service maintains a list of 632 endangered species and 190 threatened species. The law prohibits any action, administrative or substantive, that results in a "taking" of a listed species or adversely effects its habitat.
	Clean Water Act, (Section 404 (b)(1), 40 CFR 230) Guidelines for Specification of Disposal Sites for Dredged or Fill Material	The purpose of this act is to restore and maintain the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredged or fill material. Dredged or fill material should not be discharged into the aquatic ecosystem unless it can be demonstrated that such a discharge will not have an unacceptable adv rse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern. Public notice is required.
	State	
	Missouri Clean Water Law (Sect. 644 RSMo)	The Missouri Clean Water Law was enacted in 1986. The law, under Title 10, Division 20 of the CSR, established a water contaminant control agency known as the Missouri Clean Water Commission. The State. policy is consistent with the Federal policy: to conserve the waters of the State and to protect, maintain, and improve the quality of waters of the State.
Action-Specific ARARs		
Surface Water	***Federal***	
	Clean Water Act, National Pollutant Discharge Elimination System (40 CFR 122-125 and 131), Clean Water Act	Establishes discharge limitations, monitoring requirements and best management practices for any direct discharge from a point source into surface water.
	State	
	Missouri Clean Water Law (Sect. 644 RSMo)	The Missouri Clean Water Law was enacted in 1986. The law, under Title 10, Division 20 of the Code of the CSR, established a water contaminant control agency known as the Missouri Clean Water Commission. The State policy is consistent with the Federal policy: to conserve the waters of the State and to protect, maintain, and improve the quality of waters of the State.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
Richards-Gebaur AFB

Media	Requirement	Requirement Synopsis
Groundwater	***Federal***	
	Underground Injection Control Program (40 CFR 146 Subpart F)	Passed in 1980, and amended in 1982, the regulation establishes criteria and standards for underground injection control programs that place non-hazardous fluids into aquifers.
	State	
	Class III Mineral Resources Injection / Production Well Operating Permits (10 CSR 20-6.090)	This regulation, established in 1984, provides the mechanism for the State to Issue Class V underground injection permits through its Department of Environmental Quality – Water Pollution Control Program.
	Missouri Water Well Drillers Act (Sect. 319.100 RSMo)	Passed in 1994. Administered by the State Division of Geology and Land Survey. It provides standards for subsurface drilling, including construction of water wells, monitoring wells, and test holes. This law also stipulates methods for abandoning wells and boreholes, and sets permit fees for owners and standards for contractors who do such work.
USTs and Associated Soil Cleanups	***State***	
	Missouri UST Act (Sect. 644 RSMo)	The original UST Law was passed in 1989. Technical requirements are incorporated within the mandate of the Missouri Clean Water Act.
	Rules of (Missouri) Department of Natural Resources, Division 20-Clean Water Commission, Chapter 10-Underground Storage Tanks-Technical Regulations (10 CSR 20.10)	This rule contains the technical standards for USTs. This rule is designed specifically to protect the quality of groundwater in the state as well as to protect human health and the overall quality of the environment.
	MDNR, UST Closure Guidance Document, Division of Environmental Quality, Hazardous Waste Program, March 1996	Provides sections on UST closure checklist, UST closure requirements, UST registration and fees, notification requirements for UST closure, UST closure using Industry Standards, Sampling and Analysis, Treatment and Disposal, UST Closure Report, and references.
Hazardous Materials	***Federal***	
	Toxic Substances Control Act (15 U.S.C. 2601 et seq.)	The Toxic Substances Control Act was created in 1976. It institutes a range of control measures, primarily record keeping and reporting requirements, intended to document the production and use of hazardous chemicals.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
Richards-Gebaur AFB

Media	Requirement	Requirement Synopsis
Hazardous Materials	Hazardous Materials Transportation Act (49 U.S.C. 1801 et seq.)	Provides regulations governing the transportation of hazardous materials and hazardous waste. The regulations include record-keeping and reporting requirements; labeling and packaging requirements; and detailed handling requirements for each mode of transportation (rail, air, waterway, or road).
	Occupational Safety and Health Act (29 U.S.C. 61 et seq.)	Passed in 1970, OSHA was created to ensure worker safety on the job. The U.S. Department of Labor oversees the act. Worker safety at hazardous waste sites is specifically addressed under 29 CFR 1910.120: *Hazardous Waste Operations and Emergency Response*; general worker safety is covered elsewhere within the law.
Waste	***Federal***	
	Resource Conservation and Recovery Act (42 U.S.C. 321 et seq.)	The RCRA was passed in 1976. It amended the existing SWDA by including provisions for hazardous waste management. The goals of RCRA are to promote conservation of natural resources while protecting human health and the environment. The statute sets out to control the management of hazardous waste from its inception to its ultimate disposal.
	Occupational Safety and Health Act (29 U.S.C. 61 et seq.)	Passed in 1970, OSHA was created to ensure worker safety on the job. The U.S. Department of Labor oversees the act. Worker safety at hazardous waste sites is specifically addressed under 29 CFR 1910.120: *Hazardous Waste Operations and Emergency Response*; general worker safety is covered elsewhere within the law.
	State	
	Missouri Solid Waste Management Law (Sect. 260.200 RSMo)	The Missouri Solid Waste Management Law was promulgated in 1986. In it, the MDNR was authorized to administer the state Solid Waste Management Program. The program establishes permit requirements for landfill operations and sets standards for the disposal of non-hazardous waste in landfills. The regulations recognize a waste category called "special waste" that, though non-hazardous, may require special handling.
	Kansas Solid Waste Statutes and Regulations (K.A.R. 28-29)	The Kansas Solid Waste Statutes and Regulations were promulgated by the KDHE in 1972. The program is managed by the KDHE through the Bureau of Waste Management, Division of Environment.
	Missouri Hazardous Waste Management Law (Sect. 260.365 RSMo)	This law was promulgated in 1986 and established standards and rules governing management of hazardous waste consistent with Federal RCRA requirements. The program is supervised and administered by the MDNR through the Hazardous Waste Program, Division of Environmental Quality.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)
Richards-Gebaur AFB

Media	Requirement	Requirement Synopsis
Waste	Kansas Hazardous Waste Management Statutes and Regulations (K.A.R. 28-31)	The Kansas Hazardous Waste Management Statues and Regulations were promulgated by the KDHE in 1981. The program is managed by the KDHE through the Bureau of Waste Management, Division of Environment.
Air	***State***	
	Missouri Air Conservation Law	The Missouri Air Conservation Law in its present form was passed in 1986. It assigned the Missouri Air Conservation Commission to the authority of the MDNR, Division of Environmental Quality.

ARARs = applicable or relevant and appropriate requirements

ASLs = Any-Use Soil Levels

CALM = Cleanup Action Levels for Missouri

CFR = Code of Federal Regulations

CSR = Code of State Regulations

EPA = Environmental Protection Agency

KDHE = Kansas Department of Health and Environment

MDNR = Missouri Department of Natural Resources

MHW ML = Missouri Hazardous Waste Management Law

RCRA = Resource Conservation and Recovery Act

SWDA = Soil Waste Disposal Act

USC = United States Code

UST = Underground Storage Tank

VCP = Voluntary Cleanup Program